Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

FEBRUARY 1954

FOR OFFICERS AND SUPERVISORS RESPONSIBLE FOR DESIGN, CONSTRUCTION AND MAINTENANCE OF MOTIVE POWER AND ROLLING STOCK

formerly Railway Mechanical and Electrical Engineer

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om the Diesel
aintainer's Notebook

Nothing has the power of an idea whose time has come...

TRUSLOCK IS THE BIG NEWS IN BRAKE RIGGING FOR '54!

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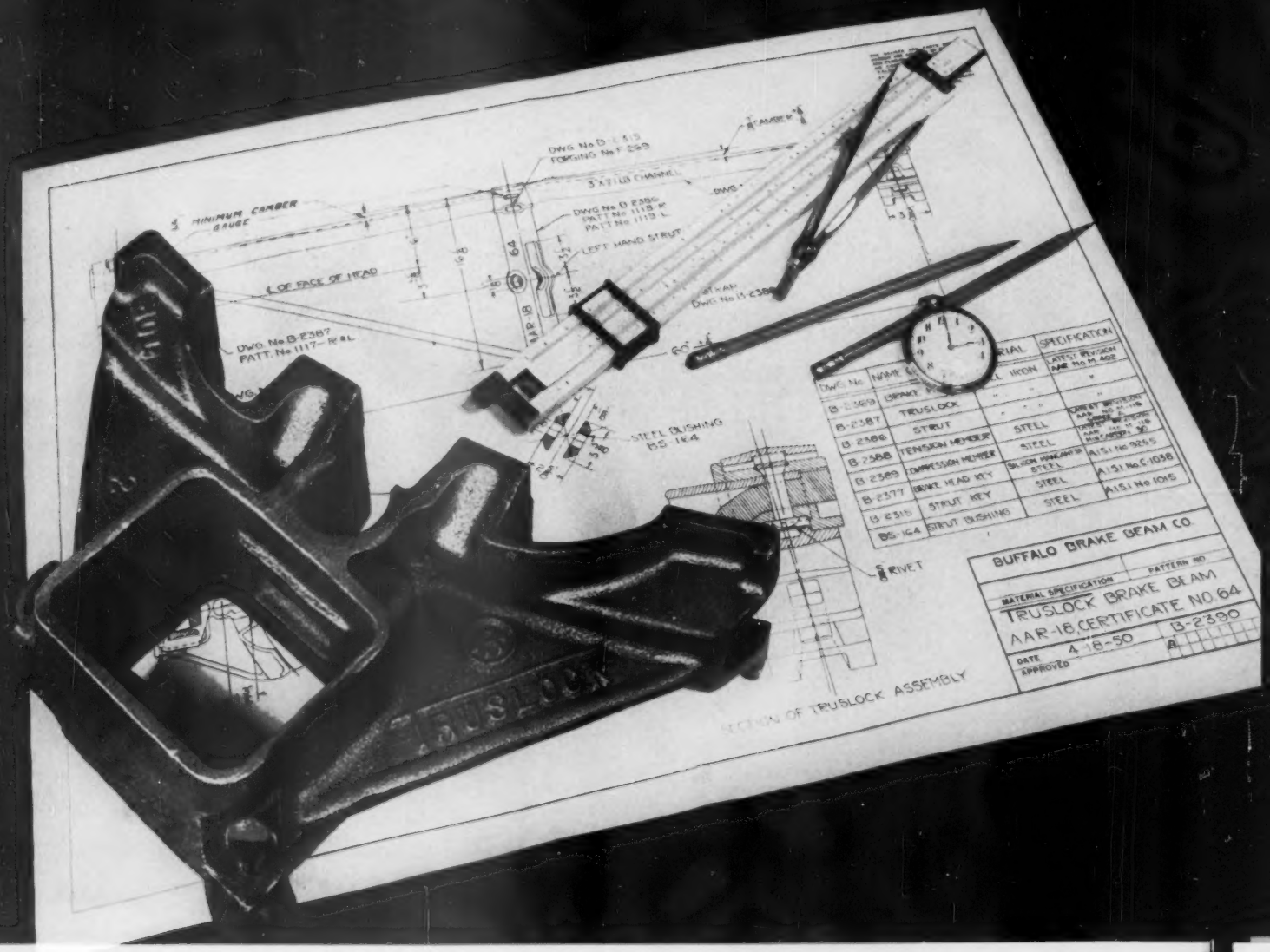
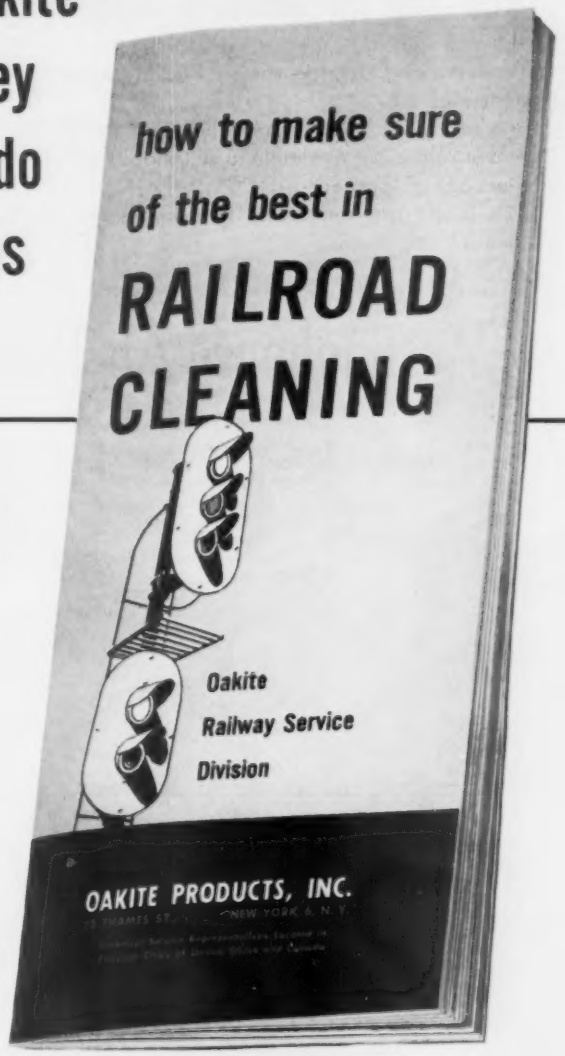


Just ONE IDEA taken from this FREE 56-page Oakite booklet can save money for your road . . . help do many maintenance jobs easier, faster, safer



Between the covers of this 56-page booklet you will find described and illustrated many job-tested cleaning short-cuts. It's the kind of practical, down-to-earth information that can lead to better maintenance and overhaul of steam and Diesel power.

You can learn how to speed up and simplify jobs such as these:

- **Cleaning Journal Boxes**
- **Cleaning and Rust-Proofing Roller Bearings by New, Mechanized Mass Production Method**
- **Semi-Automatic Cleaning of Running Gear**
- **Filter Cleaning**
- **Coach Washing . . . Manual and Mechanical**

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RAILWAY DIVISION

Here's a horn with a musical tone that is pleasing on short range and still can be heard a long way off

● For town and country—specify Westinghouse Air Brake E-2B Pneuphonic Horns.

They sound a three-note chord that simulates the steam whistle. Three variations are available to suit individual preference—low, medium or high-pitched.

E-2B Horns are completely interchangeable on the present mounting base.

Westinghouse Air Brake
COMPANY

AIR BRAKE DIVISION WILMERDING, PA.

February, 1954

VOLUME 128

No. 2

RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal.

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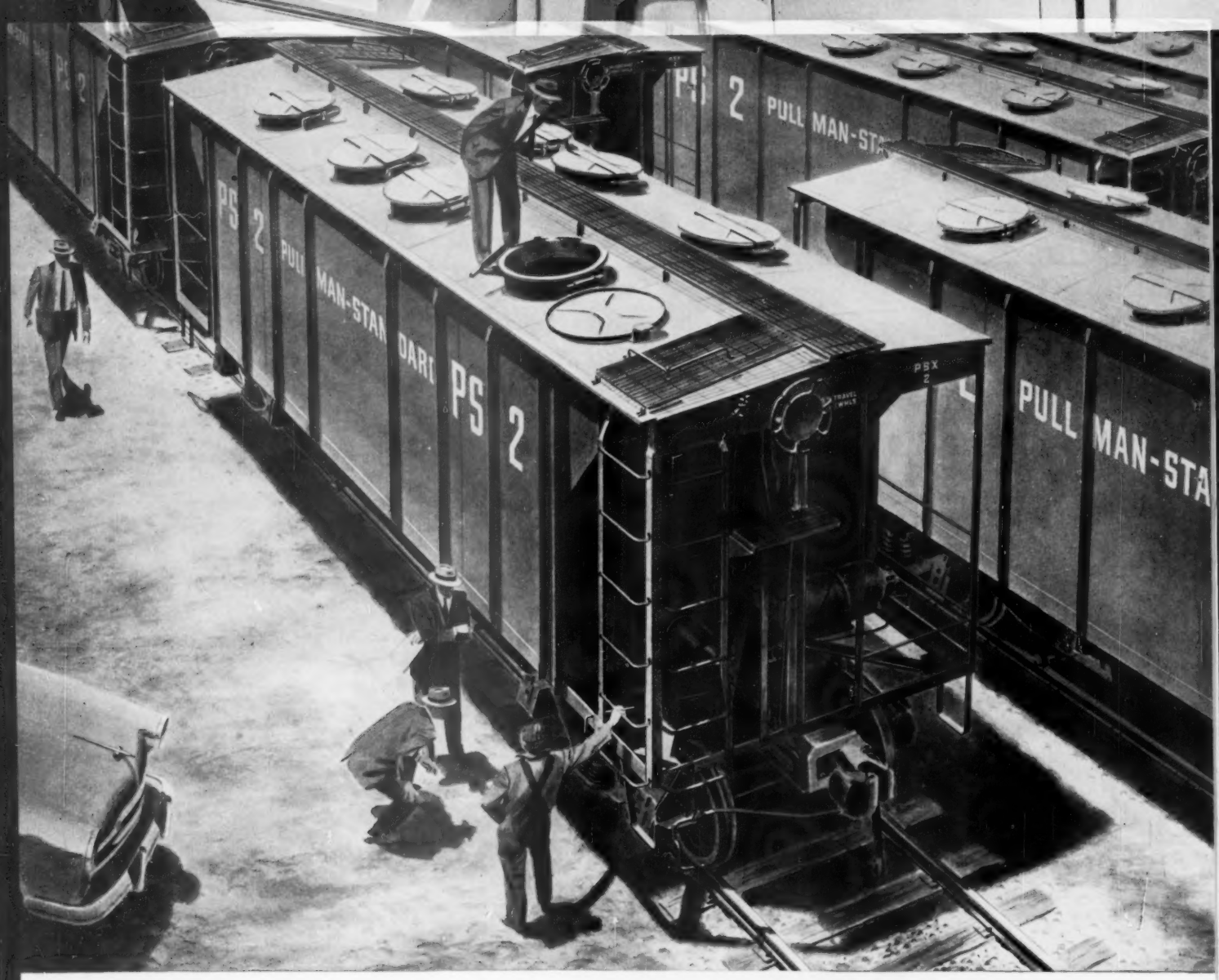


THE PS-2 COVERED HOPPER CAR

The PS-2 Covered Hopper Car represents another Pullman-Standard achievement in freight-car standardization for dependability and economy. The design is new, and production includes extensive use of automatic arc welding.

In addition to the sturdier construction, characteristic of standardized freight cars, some of the PS-2's features include: improved circular hatches; smooth self-cleaning hoppers; and a sturdier, safer roof.

NEW BOOKLETS

Anyone concerned with Covered Hopper Cars, Box Cars or Hopper Cars will be interested in the facts, specifications and details contained in these illustrated booklets. Write for a copy of any one or all three.

LOOK at these standardized cars

Like the PS-1 Box Car and the PS-3 Hopper Car, the PS-2 Covered Hopper Car is the result of tested design and continuous production.

This means that railroads are benefiting from top-quality freight cars produced more economically.

These standardized cars include the advantages of continuous production and the economies of specialized tools and techniques.

Their stamina and continual improvement are influenced by "on-line" checking by Pullman-Standard Sales and Service engineers and laboratory testing by Research and Development engineers.

Features of the new PS-2s are many: new all-around strength; special welded design that means quick, clean unloading with no material retaining ledges, projections or structural pockets; and new center pressure locking hatch covers, on the circular hatches, add weather protection.

PS-2 design allows this car to be adapted to a three or four-hopper car for the transportation of various bulk commodities.

1,405 PS-2 Covered Hopper Cars have been bought by ten railroads—an indication that standardized cars are a sound, revenue-building investment.

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

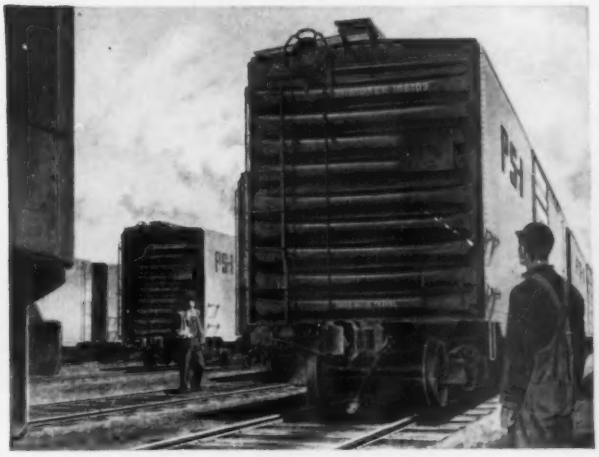
PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

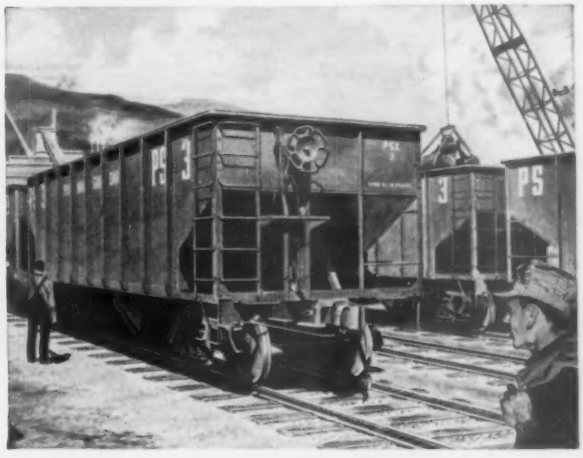
79 EAST ADAMS STREET, CHICAGO 3, ILLINOIS

BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON



THE PS-1 BOX CAR

The PS-1 is a good example of the progressing standard which is so important in the successful operation of these cars. Pullman-Standard Research and Development engineers have never stopped testing, proving and improving the standardized PS-1. They continue to anticipate the railroads' needs for better, more economical freight cars. Under laboratory control, Research and Development technicians reproduce service hazards. The cars are subject to conditions more severe than those actually ever encountered.



THE PS-3 HOPPER CAR

The specifications of the PS-3 resulted from a thorough inspection of virtually every type of hopper car in service, and from a study of the effect, on the cars, of current handling practices. They incorporate proven advantages, omit potential trouble spots.

Among the objectives set for these cars were three which dictated welded construction: maximum strength at all vital points, maximum corrosion resistance, and smooth interiors for fast loading.

ALL 3 → P-S Standardized Cars —provide top quality, economically

Have you seen the PS-3 Hopper Car? If not, you'll find it worth while to do so. Because, like the PS-1 Box Car and the PS-2 Covered Hopper Car, it affords all of the benefits of tested design and continuous production.

These cars reflect the total experience and resources of Pullman-Standard's engineers. It is the Research and Development engineers' job to help create and continually test components and completed cars. It is their assignment to always search for better ways to make better cars.

The stamina and continual improvement of the PS-1, 2 and 3 are influenced by "on-line" checking by Pullman-Standard's Sales and Service engineers. These men travel thousands of miles every month to observe performances under operating conditions—to obtain significant data on cars of all makes.

Be sure to see the standardized PS cars that are proving, to more and more railroads, that *top quality can be produced economically through standardization.*

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

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CAR MANUFACTURING COMPANY

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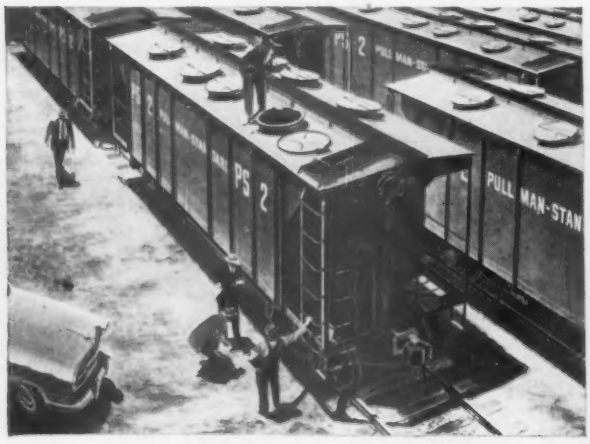
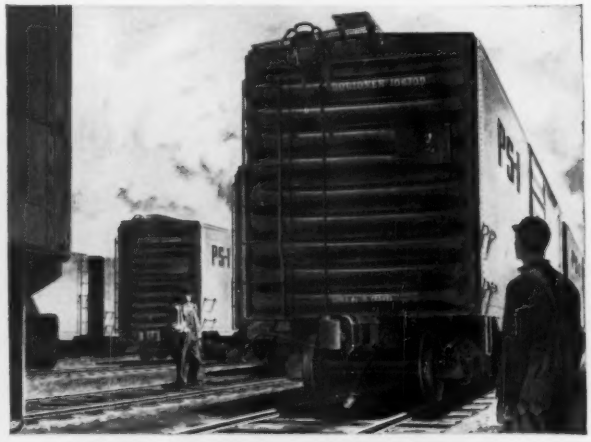


THE PS-2 COVERED HOPPER CAR

The PS-2 Covered Hopper Car presents another Pullman-Standard achievement in freight car standardization for dependability and economy.

The design is new. It permits the use of the most modern methods of car construction and production including the extensive use of automatic arc welding.

Besides stronger construction, some of the PS-2's features include: improved circular hatches; smooth self-cleaning hoppers; and a sturdier, safer roof.



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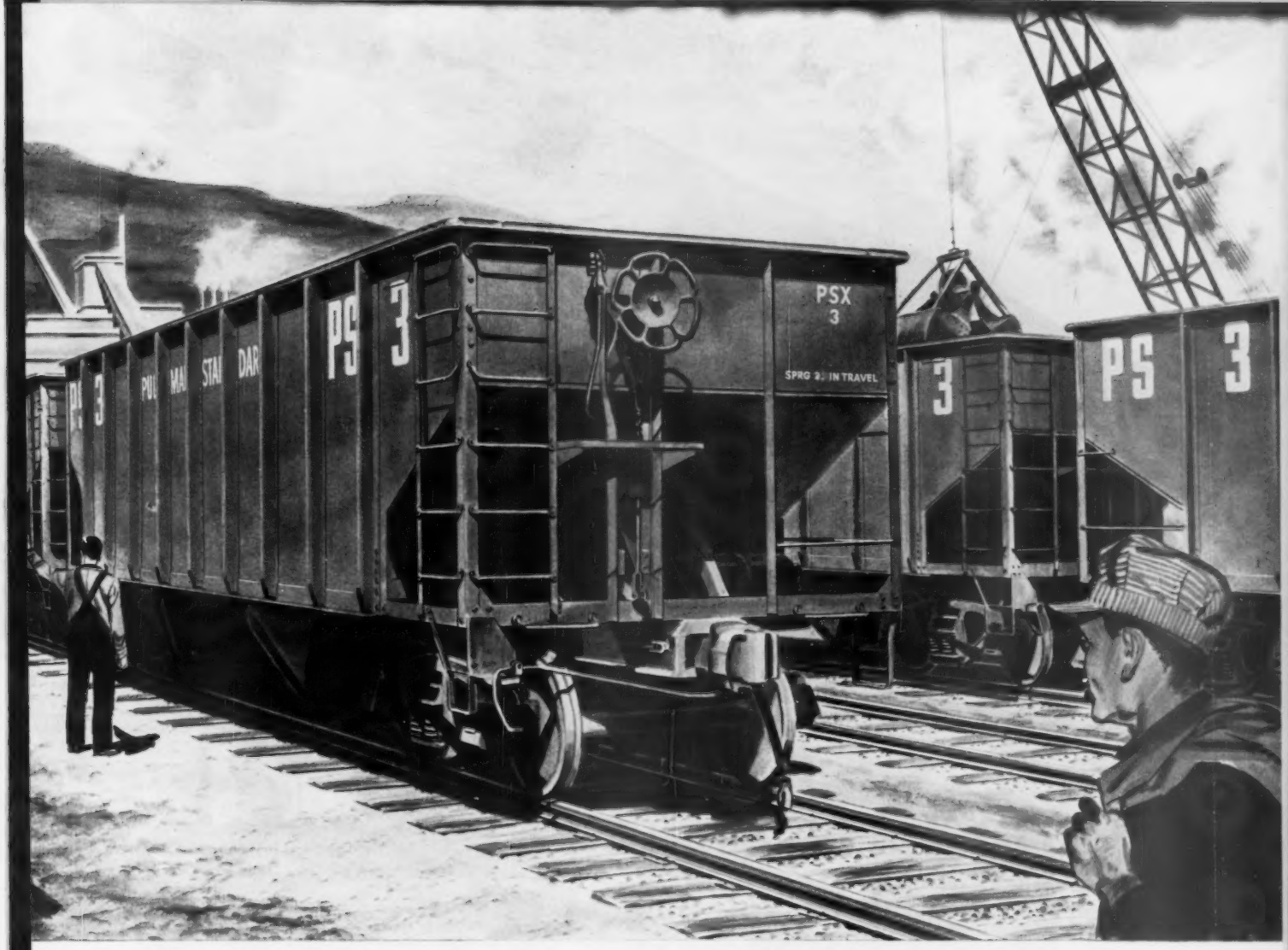


THE PS-3 HOPPER CAR

In the development of the PS-3, three important objectives dictated welded construction. They were, to provide: (1) maximum strength at all vital points, (2) maximum corrosion resistance and (3) smooth interiors for speedy unloading.

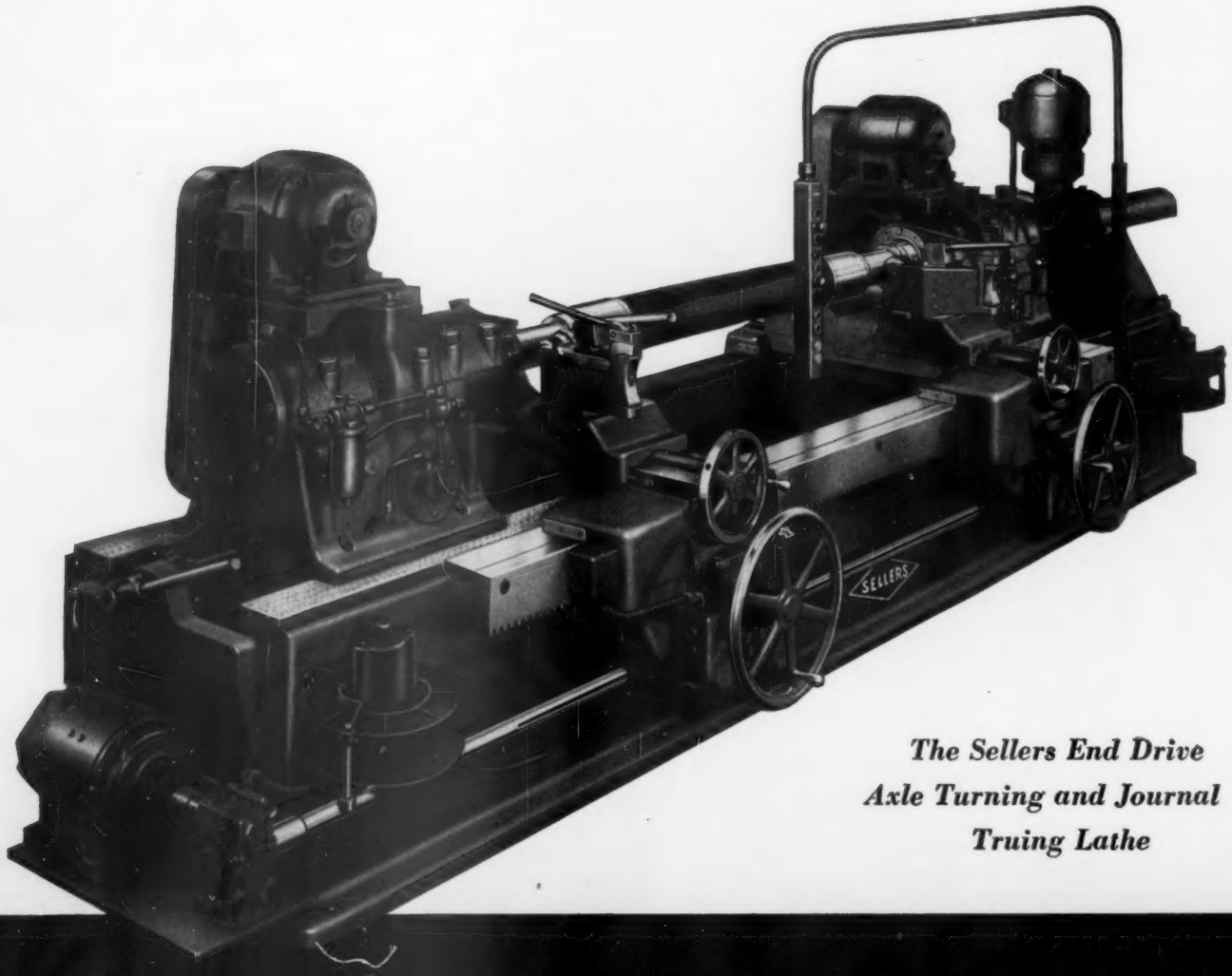
The PS-3 Hopper Car incorporates proven advantages. Virtually every type of hopper car in service today was studied. The effects of current handling practices were prime considerations in its design.

All of the components of the PS-3 are designed and constructed to work together as a unit to produce balanced strength throughout the car.

NEW BOOKLETS

Anyone concerned with Covered Hopper Cars, Box Cars or Hopper Cars will be interested in the facts, specifications and details contained in these illustrated booklets. Write for a copy of any one or all three.

TWO . . .



The Sellers End Drive Axle Turning and Journal Truing Lathe

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

. . . *for* ONE !

If you are turning and burnishing axles on old style axle lathes, you are probably getting 8 to 10 axles per machine in eight hours.

If you had the Sellers End Drive Axle Lathe in your shop, you could turn and burnish *twice that many* in eight hours.

CORPORATION, ROCHESTER, N.Y.

Birmingham Company, Incorporated

HYATT freight car boxes ...EASIEST to inspect...

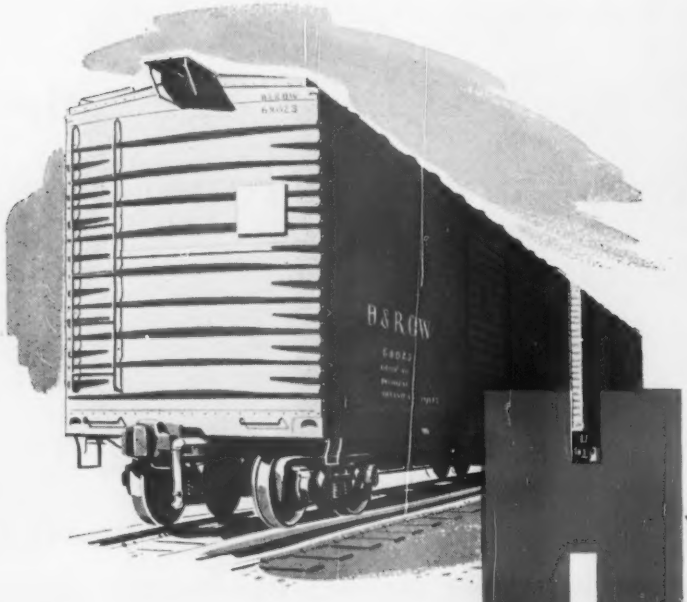
★Free Lateral *(reduces wear on truck parts and wheel flanges)* Adjustments ★Press Fits are Not Disturbed when

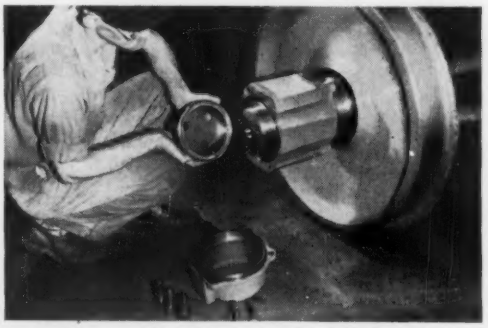
You know all about the immediate benefits of roller bearings for freight cars. They eliminate the hot box problem and safely permit the higher freight speeds demanded by shippers. But, over the *long haul*, additional benefits—provided only by *Hyatts*—become increasingly important. We're talking about Hyatt's *ease of installation and maintenance!*

Installation of Hyatt Boxes is the ultimate in ease and simplicity. The one-piece bearing inner race is heated and shrunk on the axle journal, so that it becomes, for all practical purposes, a permanent part of the journal. Then the journal box, *just as it is received from the factory*, is simply slipped on over the inner race. After bolting a locking cup to the end of the axle, and adding the prescribed amount of lubricant, the box is ready to roll! *No bearing adjustments are necessary!* And, disassembly is equally simple. *Press fits are not disturbed*, either when removing a box or removing a wheel, and because spare axles and wheels need to be fitted with inner races only, *spare parts inventory is substantially reduced.*

Your roller bearing cars will be in service for many, many years, and with each journal box certain to be removed many times for wheel work, truck work and periodic inspection, Hyatt's amazingly simple assembly procedure means real savings—savings that will multiply as the number of Hyatt-equipped cars increases. Add the advantages of Hyatt's "free lateral" design—meaning less wear on truck parts and wheel flanges, and less damage to lading—and you'll easily understand why the big swing is to *"Hyatts for Freight!"*

For further information write for the new Hyatt Freight Car Journal Box Maintenance Manual. Hyatt Bearing Division, General Motors Corporation, Harrison, New Jersey.





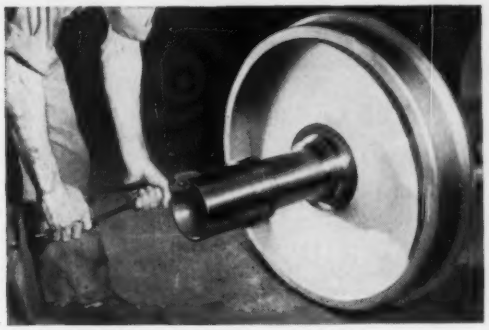
3 Locking cup is applied to end of axle. With cover removed from the box, locking cup is bolted to axle-end. Bolts are tightened to a specified torque and wired together.

HYATT

STRAIGHT ROLLER BARREL ROLLER TAPER ROLLER

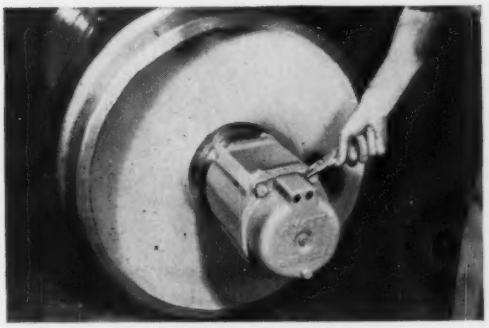
are EASIEST to install
EASIEST to maintain!

★ One-Piece Inner Race ★ No Pre-assembly
Removing Boxes ★ Parts Inventory Reduced

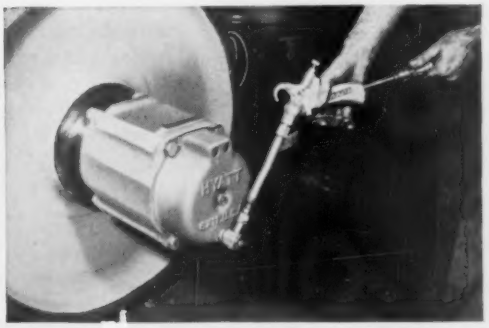


1 One-piece inner race is applied to axle journal. Inner race is heated uniformly to 300°-325°F, slipped on the journal, and shrunk into position. *No spacers or mounting fixtures are required.*

2 Journal box is applied to axle. Hyatt Boxes are ready for application *just as they come from the factory.* Simply remove shipping cover and slip box onto inner race. *There are no pre-assembly adjustments!*



4 Front cover is reapplied. Bolts are tightened and wired together in pairs.

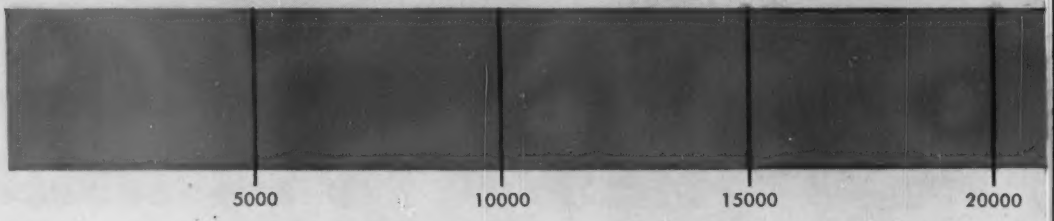


5 Grease is added and the box is ready to roll! Using a grease gun, the prescribed amount of lubricant can be added through fittings in cover.

ROLLER BEARING JOURNAL BOXES

LADING DAMAGE INDEX

Car Outbound
Mounted on short-travel coil springs



Same Car Inbound
Mounted on ASF Ride-Control Packages

VISUAL PROOF

Detailed results of typical test run...Compare the "before and after" riding qualities of the test car!

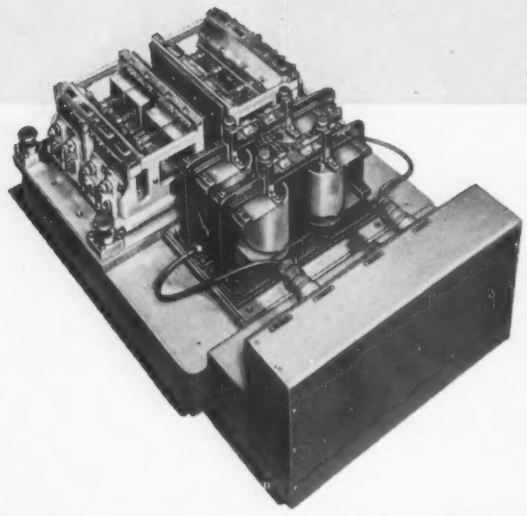
CAR OUTBOUND	Service Factors	SAME CAR INBOUND
27.9 Miles	Distance	27.9 Miles
145,000 Lbs.	Rail Load	145,000 Lbs.
AAR 1936 Coils	Type Springing*	ASF Ride-Control Packages
56 M.P.H.	Maximum Speed	84 M.P.H.

Actual Impact Count—and Lading Damage Index Factor

10,908	.25G	4894 x 1 — 4,894	2,699	.25G	2590 x 1 — 2,590
6,014	.50G	3631 x 4 —14,524	109	.50G	100 x 4 — 400
2,383	.75G	1667 x 9 —15,003	9	.75G	7 x 9 — 63
716	1.00G	716 x 16—11,456	2	1.00G	2 x 16— 32
Lading Damage Index		**45,877**	Lading Damage Index		**3,085**

(NOTE: Lading damage index reduced 93.3%. Discount the relatively harmless .25G impacts and the reduction is 98.7%, even though test car travelled 84 M. P. H. on the return trip!)

Approximate time required for change to Ride-Control Packages: 12 minutes!

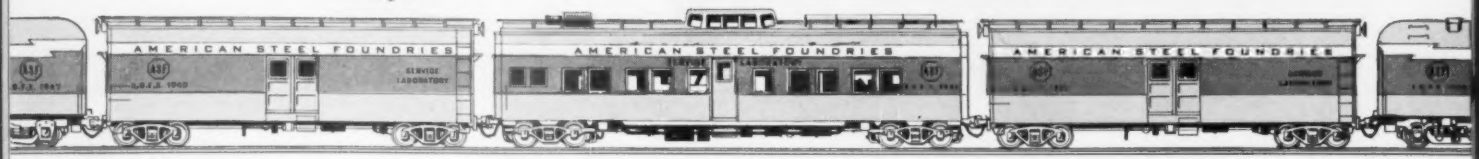


How the tests were conducted

Consist of ASF Test Train at Atlantic City was 2 identical 50-ton box cars, an "operations car" (with observation dome) and 2 passenger cars.

One box car was equipped with ASF Ride-Control Trucks. The other box car was mounted on AAR 1936 coils for the outbound run; for the return trip *on the same track*, it was remounted on ASF Ride-Control Packages.

Sensitive accelerometers (shown at left) were located at each end of each box car. They measured the lateral and vertical shocks, recorded in the operations car.



# of smoother freight hauls!

Take a freight car with short-travel coil springs ...remount it on ASF Ride-Control® Packages ...and the graph above shows how the lading damage index is reduced over 90%.

One of the fastest ways to cut lading damage claims is to bring *all* your freight cars up to modern riding standards . . . *credit old short-travel springs against an investment in ASF Ride-Control Packages.* The Atlantic City runs with the ASF Test Train prove how a quick changeover from 1936 coils to the Package practically revolutionizes the riding qualities of an otherwise identical car. Typical test results are shown at left.

And, smoother riding is only the most obvious reason why ASF Ride-Control Packages quickly pay for themselves. Ask yourself how much rough riding costs your road in terms of frequent car repairs, higher maintenance of way, cars suitable for restricted use only. Then consider the economy of a general repairs program that includes giving your older cars riding qualities closely comparable to a brand-new car!

* * *

Call your nearest ASF Representative—for the facts on how an investment in Ride-Control Packages can quickly be written off.

Bring YOUR older cars up to modern riding standards...with

ASF

RIDE-CONTROL PACKAGES

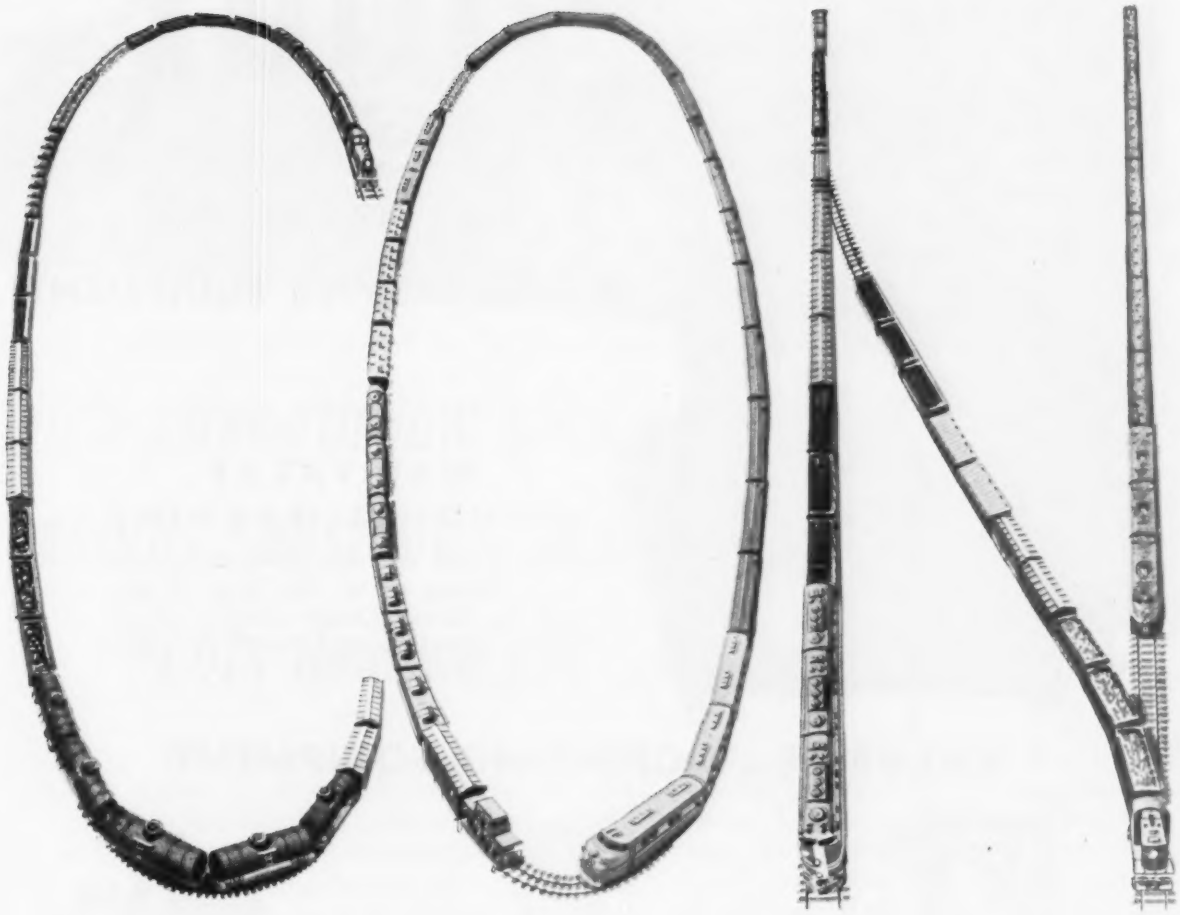
AMERICAN STEEL FOUNDRIES

410 N. Michigan Avenue, Chicago 11, Illinois

Look for this MINT ◯ MARK on the running gear you specify

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec

... Specified by More than 100 Leading U.S. Railroads!



The answer to dependable Diesel lubrication is spelled GASCON®. An incomparable record of performance has made Sinclair GASCON the standard of quality – against which all other Diesel oils are compared. Most of America's top railroads have discovered this to be true – have you?

SINCLAIR RAILROAD LUBRICANTS

SINCLAIR REFINING COMPANY

RAILWAY SALES • NEW YORK • CHICAGO • ST. LOUIS • HOUSTON

DIESEL LOCOMOTIVE MANUFACTURERS

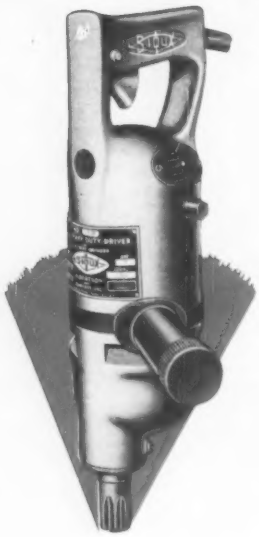
Recommend SIOUX

AS STANDARD VALVE SERVICE EQUIPMENT

WET VALVE GRINDING MACHINE

Wet grinds valves, valve ends, tappets, rocker arms. No heat or distortion. Finest finish—factory precision. Handles valves to 6" dia. head — Stems to 1¼".

VALVE SEAT GRINDING EQUIPMENT



HEAVY DUTY DRIVER WITH SIDE HANDLE

For use with 4"-6" Valve Seat grinding wheels.

BALL BEARING GRINDING WHEEL HOLDER

LIFTING SPRING PERMITS BRINGING WHEEL UP TO SPEED BEFORE GRINDING

"Basic Set" includes Heavy Duty Driver, Dressing Tool, Holders, Spanner Wrench, Holder Clamp, Indicator, Pin, Special Lifting Springs, Metal Box, Shipping weight approximately 180 lbs.

"STANDARD THE WORLD OVER"

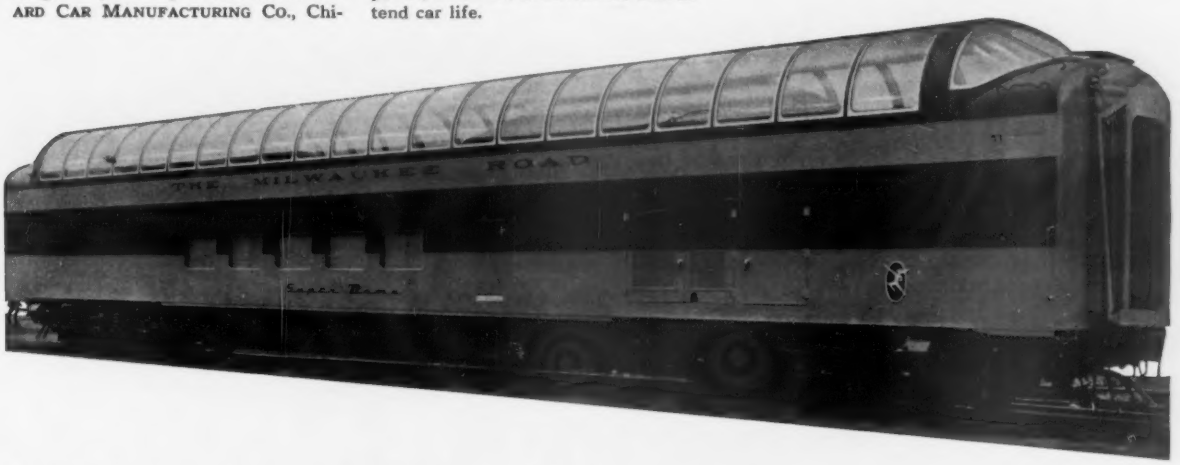
Sold only thru Authorized SIOUX Distributors

WRITE FOR MORE INFORMATION

ALBERTSON & CO., INC.

Sioux City, Iowa, U.S.A.

SAVINGS ARE SURE when you cut the weight of your cars by designing to use high strength, low alloy steels containing nickel. This "Dome" type passenger car, built by PULLMAN STANDARD CAR MANUFACTURING CO., Chicago, Ill., utilizes the superior stamina and corrosion resistance of U•S•S COR-TEN steel, produced by UNITED STATES STEEL CORP., Pittsburgh, Pa., to save power, minimize maintenance and extend car life.



High strength low alloy steel assures substantial economies

cuts deadweight...lengthens car life

Without sacrificing strength or safety, the majority of railroads have trimmed deadweight from cars by utilizing high strength, low alloy steels containing nickel . . .

Under actual operating conditions on major roads, repeated tests have shown the nickel alloyed steels to be five times more corrosion-resisting than carbon steels, and two and one-half times that of copper-bearing steel. This superior corrosion resistance adds years of useful service to car life.

The smaller quantity of rust which forms on high strength, low alloy steels containing nickel is of a more impervious nature than the rust which forms on carbon or copper-bearing steels. Denser and more adherent, it also accounts for a longer paint life than is obtained on copper-bearing steel coated with the same paint system.

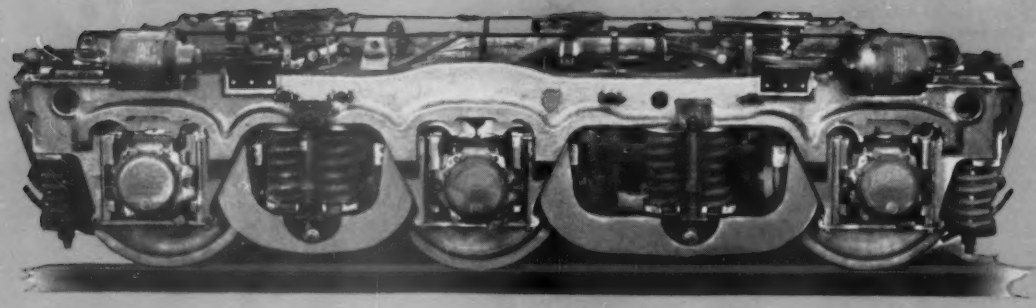
You can cut deadweight since thinner, lighter sections of the nickel alloy steels, provide the same strength and ruggedness as thicker, heavier sections of plain carbon steels. On the other hand, by using these nickel alloy steels with the same section thickness as the plain carbon steels, you add years to the useful life.

In addition to resistance to corrosion and superior strength, the nickel alloy steels withstand shocks . . . battering and piercing . . . and abrasion. And they show excellent response to usual fabricating operations, including forming and welding.

Especially suited for railroad applications, high strength, low alloy steels containing nickel along with other alloying elements are produced under various trade names by leading steel companies. Consult us on the use of these steels in your products or equipment. Write today.

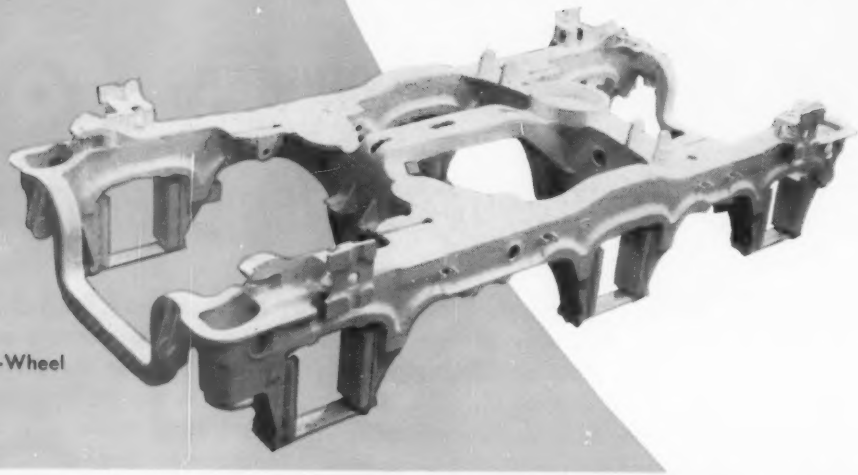
INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

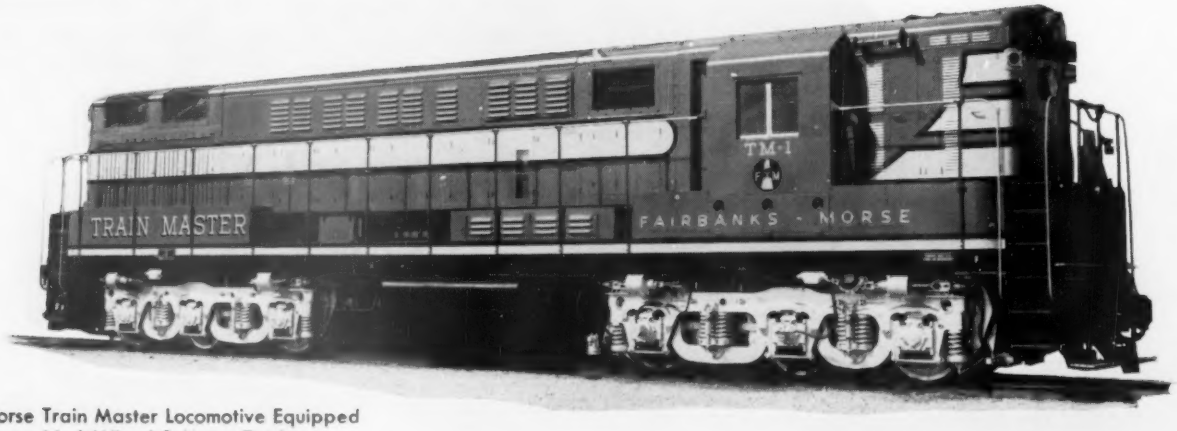


Commonwealth 6-Wheel 3-Motor Truck for 2400 H.P.
Fairbanks-Morse Train Master Locomotives.

The Proven Design



One-Piece Cast Steel 6-Wheel
Motor Truck Frame.



Fairbanks-Morse Train Master Locomotive Equipped
with Commonwealth 6-Wheel 3-Motor Trucks.

GENERAL STEEL

2400 H.P. Train Master Locomotive Built by Fairbanks-Morse.

# of One-Piece Cast Steel Truck Frames Assures Maintenance-Free Performance for COMMONWEALTH Diesel Motor Trucks

COMMONWEALTH Motor Trucks provide exceptionally dependable performance, most economical operation, and easy riding at all times. The well-designed rugged steel castings assure maintenance-free life and increased locomotive availability.

Train Master locomotives have COMMONWEALTH 6-wheel 3-motor trucks arranged with equalizers for positive equalization and all-coil springing with snubber control. This design of truck provides maximum accessibility to all motors.

Over many years, thousands of Diesel locomotives of every type have been built with COMMONWEALTH Motor Trucks.

CASTINGS

GRANITE CITY, ILLINOIS
EDDYSTONE, PA.

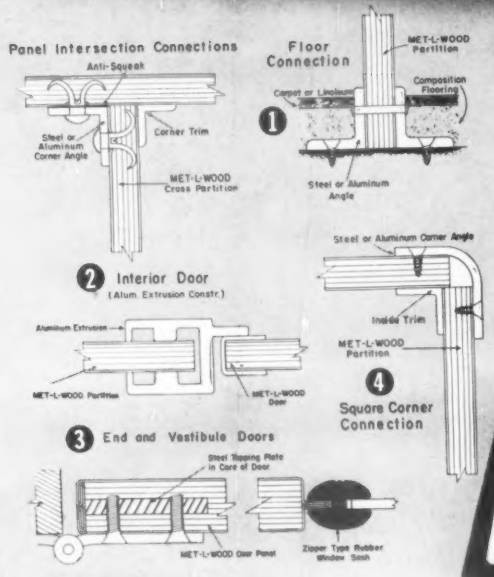
MET-L-WOOD
METAL BONDED TO PLYWOOD

VERSATILITY

FOR MODERN CAR INTERIORS

Met-L-Wood walls provide a smooth, luxurious finish in addition to saving weight and simplifying construction.

MET-L-WOOD passenger car partitions, doors and paneling not only produce beautiful finished surfaces, but can also save up to 73%* in weight and a substantial amount of construction time. Shown at left, and described below are typical Met-L-Wood construction details. Full information on Met-L-Wood versatility in new or rebuilt cars will be furnished promptly on request. Write today.



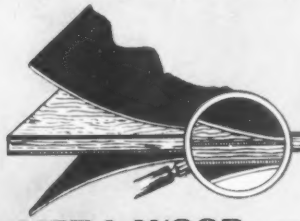
❶ Panel intersections with Met-L-Wood can be made invisible from outside with the use of split rivets. Floor connections may be made in a variety of ways, one of which is shown here, using through-rivets and metal screws.

❷ Interior doors of Met-L-Wood can be fitted with aluminum extrusion door stops; or the Met-L-Wood partition formed so that the door stop is an integral part of the panel.

❸ Steel tapping plate inserts can be put in Met-L-Wood doors at proper places for solidly anchoring hinges and door-opening devices. Note simplicity of using zipper-type window sash with pre-formed Met-L-Wood window openings.

❹ Square or rounded corners are made with Met-L-Wood panels and steel or aluminum corner forms. Corner forms can also be fastened with split rivets or through-rivets, as well as with wood or metal screws.

*Met-L-Wood panels 3/8" thick, with steel both sides, have a stiffness factor exceeding that of 1/4" solid steel plate, while weighing only 27% as much as steel!



MET-L-WOOD CORPORATION

6755 West 65th Street, Chicago 38, Illinois

MET-L-WOOD • *STRONG... LIGHT... Smooth Finish... Sound Deadening... Fire-Resisting... Insulating*

LONG RUN
OR SHORT HAUL

NATIONAL BRUSHES COST LESS!
TRADE-MARK

● This country's railroads have demonstrated NATIONAL CARBON'S claim to greater operating economy by using far more "National" diesel-electric traction-motor and generator brushes than all other makes combined.

There's no guesswork behind this overwhelming preference for "National" brushes. Users have proved to themselves again and again in comparative service testing that "National" brushes keep them *miles ahead* — whether balling the jack cross-country or bucking the local freight.

NATIONAL CARBON'S unmatched experience in the diesel-electric brush field . . . its unique research, development and manufacturing facilities work together for *you* . . . pay off in lower maintenance, improved commutator condition and longer brush life.

HOW GOOD IS REALLY GOOD BRUSH PERFORMANCE?... Use "National" Brushes and SEE!

The term "National", the Three Pyramids device, and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

1933 UNITED STATES STEEL USS HIGH STRENGTH STEELS 1953

TWENTY YEARS OF PERFORMANCE

6,000 passenger cars have been built

THE "NEW LOOK" IN PASSENGER COACHES IN 1934

Fresh from the Worcester shops of Pullman Standard Car Mfg. Co., this coach is the first of 50 streamlined passenger cars built for the New York, New Haven and Hartford Railroad Company over 19 years ago. Describing this equipment, RAILWAY AGE in its Jan. 5, 1935 issue says, "Built to provide the maximum in comfort with an improved appearance, it represents a pleasing transition from the conventional in railroad passenger equipment to the more radical designs which the future may bring."

STILL "NEW LOOKING" AFTER 19 YEARS OF SERVICE

From its appearance today it is hard to realize that this New Haven car, like the others built in 1934, has been in operation for almost two decades. Its present excellent condition is primarily due to forward-looking engineering both in design and construction and to the choice of materials well able to meet service requirements. Still thoroughly modern, it shows both inside and out the remarkable ability of lightweight COR-TEN steel equipment to stay in revenue-producing service year after year.

better with USS COR-TEN steel since 1933

The New Haven's first streamlined coaches

in service since 1934

prove the durability of lightweight construction with USS COR-TEN High Strength Steel

PASSENGERS on the New Haven opened their eyes in amazement when they stepped into these cars almost twenty years ago. For here was something entirely new and different in coach service. Sleek streamlined exteriors. Attractively decorated interiors. Improved lighting. Extra wide windows. Air conditioning. Individual seating. Here for the first time was superior traveling comfort at coach fare rates.

And for the railroad company, here were 50 cars weighing only 107,500 lbs. each—38,500 lbs. less per car than conventional equipment would have weighed. In addition, these cars were able to carry as many passengers as 50 old-style cars with no more power than was required to haul 37 conventional units.

The original 50 New Haven streamlined coaches were quickly followed by 100 more. By 1938, 205 units of like design and construction had been put into service. After the war, the New Haven ordered additional cars including diners, grill and parlor-observation cars so that today they have 385 of these COR-TEN-built units in service.

All of this equipment has been periodically shopped on a four-year basis. And speaking particularly of the cars built up to 1938, the New Haven's General Mechanical Superintendent says, "A close inspection has been made of the COR-TEN steel construction and—aside from defects which can be attributed to wear and tear—we have found the material to be in satisfactory condition. COR-TEN steel in general has given very good service."

• • • •

What is especially significant in this report is the fact that in these cars, which are up to 26.3% lighter than conventional design, body weight has been reduced from 54,700 lbs. to 29,600 lbs. by using USS COR-TEN steel in one-half the thicknesses required by conventional material.

USS COR-TEN steel is now used in more than 6000 cars to reduce weight and ensure safety, durability and operating economies

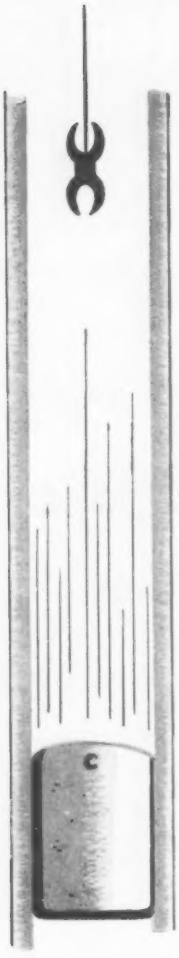
The universally good performance of USS COR-TEN steel in early applications like the New Haven cars is only one reason why this superior structural steel is so widely used today in equipment that ranks as the most modern, efficient and also as the most profitable to operate. For not only does USS COR-TEN steel provide high strength and superior resistance to atmospheric corrosion but it lends itself readily to advanced fabrication techniques. In addition the cost of USS COR-TEN steel is comparatively low.

Over twenty years' experience in helping car builders and railways apply USS COR-TEN steel in passenger car units of every type, as well as in more than 180,000 freight cars of all kinds, has given us a background of practical knowledge which is freely placed at your disposal.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

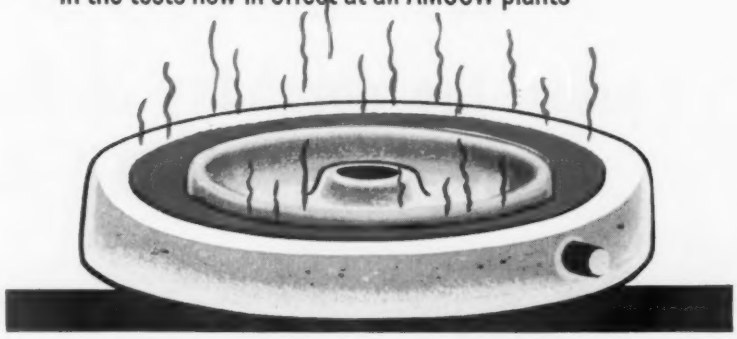
UNITED STATES STEEL



Here a 250-pound tup is dropped on the hub of a wheel. Number of drops now increased 25%. Even so, it is a mighty rare occasion when the new AMCCW chilled car wheel breaks under this severe test.

tougher tests for a tougher wheel

the new AMCCW wheel proves it can take it in the tests now in effect at all AMCCW plants



In this test, molten metal is poured around the tread of a cold wheel, setting up thermal strains similar to those encountered in prolonged braking. The slightest evidence of cracking disqualifies a wheel. Length of test time now increased 25%.

All AMCCW wheels are now being inspected on the basis of more severe test specifications, voluntarily adopted by the Association in February, 1953.

These same specifications have been adopted by the AAR, and are now official.

The tougher tests are a logical development of continuous improvement of AMCCW manufacturing methods and AMCCW wheels, resulting over the years in dramatic improvement in wheel performance... from 89,000,000 car miles per wheel failure in the five-year period 1938-42 to 128,600,000 car miles per wheel failure in the period of 1948-52!

Tougher tests like these assure continued advances in the years ahead.

AMCCW

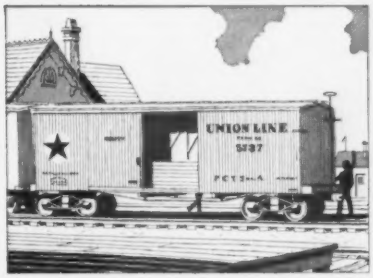
In good supply
Available locally
Short-haul delivery
Reduced inventory
Low first cost
Low exchange cost
Increased ton mileage
High safety standards
AMCCW plant inspection
Easier shop handling

Association of Manufacturers of Chilled Car Wheels

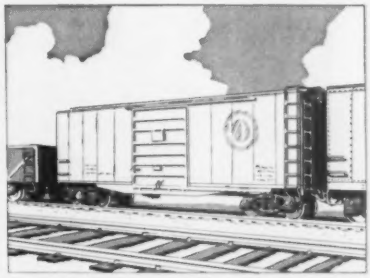
445 North Sacramento Boulevard, Chicago 12, Ill.

Albany Car Wheel Co. • American Car & Foundry Co.
Marshall Car Wheel & Foundry Co. • Griffin Wheel Co.
Pullman-Standard Car Mfg. Co. • Southern Wheel (American Brake Shoe Co.)

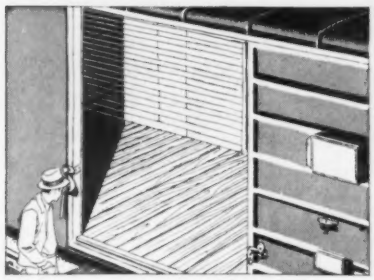
How a little thing like this pointed the way to freight car progress



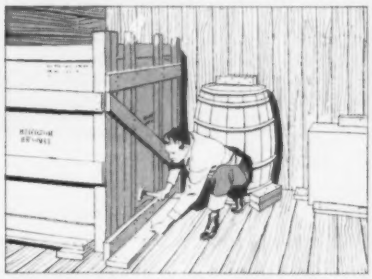
Fifty years ago, boxcars were almost completely wooden—roofs, sides, ends, even underframes. Cars like that needed frequent repair—and still had many infirmities.



Through the years, part after part was converted to steel. Railroad men made as much progress as possible, until cars became the almost-all-steel units seen on the rails today.

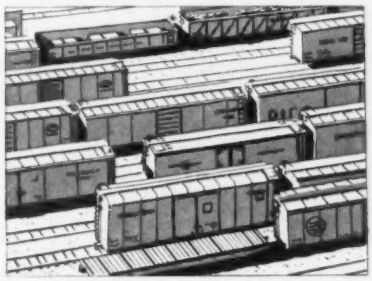


Each conversion to steel added strength and durability, reduced downtime, saved maintenance. The last important non-steel part was the floor, and for good reason.

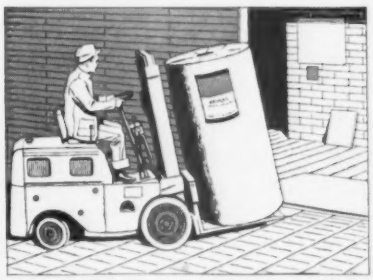


For transit, much finished freight must be secured with blocks *nailed* into place. So it's the *nailability* of wood that has kept it in use as car flooring material.

Railroad men have long wanted to apply to floors the recognized advantages of steel. Now NAILABLE STEEL FLOORING provides these advantages, along with extras of its own.



Showing up in Car Department plans today are more and more of these floors which progress the freight car's evolution to steel. They're used by over 50 railroads.



All the abuse of normal use just rolls off N-S-F. And like no other flooring, N-S-F, welded to the frame, actually adds strength at critical points of the car structure.

Careful analysis of its advantages will establish how NAILABLE STEEL FLOORING in freight cars will soon pay for itself by reducing car operating costs in the future.

N-S-F is made of low alloy N-A-X HIGH-TENSILE steel—remarkably strong, corrosion-resistant—formed into channels, and welded together to form a unique nailing groove. Nail is clinched in a tight grip of steel, yet can be readily removed.

COMPLETE engineering and cost data available from Great Lakes Steel Corporation, Steel Floor Division, Ecorse, Detroit 29, Michigan. Sales representatives in Chicago, Philadelphia, St. Louis, Atlanta, Omaha, Denver, San Francisco, Montreal and New York.

GREAT LAKES STEEL CORPORATION

NATIONAL STEEL CORPORATION

53-SF-12-B

Car Flooring That's Made to LAST

Armco Freight Car Flooring is designed to eliminate the weaknesses of wood or steel plate floors. It is made to *last longer* and give better protection to lading. This composite floor gets its high strength from steel hat-sections welded to the car frame. The wood planks are for nailing.

Wood Floors Can't Take it

Concentrated loads and impacts shorten the life of wood floors. Each plank must serve as a beam. Standard wood floor planks just don't have the necessary beam strength.

Plate Floors Will Belly

Steel plate floors become deformed and unsuited for many types of lading. Damage to open car floors starts with dropped loads and the impact of clamshell buckets when unloading aggregates.

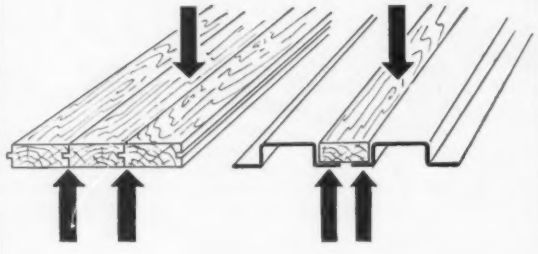
Why a Hat Section Rib?

The Armco hat-section rib has the strength that is needed to resist concentrated loads and impacts. Its design gives the best combination of beam strength and floor surface per pound of steel.

No Point of Weakness

When there is a concentrated load on the wood nailing strip, the load is transferred to a pair of steel ribs through their flanges. There is *no point of weakness* in the Armco Freight Car Floor.

For complete information, write for the new booklet, "Armco Freight Car Flooring."



In a wood floor loads concentrated on one plank are shared by adjacent planks through wood tongue and groove.

In an Armco Freight Car Floor a load concentrated on the nailing strip is supported continuously by two steel ribs.

ARMCO STEEL CORPORATION

4373 Curtis Street, Middletown, Ohio • Export: The Armco International Corporation

we have a plan

for better maintenance of your off-track equipment

Pictures courtesy of Le Tourneau-Westinghouse Company, a subsidiary of Westinghouse Air Brake Company.

• • • a plan that includes these features—

1. Uniform high quality lubricants and fuels throughout your system to keep equipment operating smoothly and continuously.
2. Expert petroleum engineering counsel that will help lower your maintenance costs.
3. Simplified lubricant storage and handling, resulting from the use of fewer brands.
4. Prompt delivery service when and where you need it to give you all-round smoother operation.

Gulf has had wide experience servicing the equipment of leading earth-moving contractors. This experience can aid you to gain smoother operation on every job.

All you have to do to gain the advantages this plan offers is to call in a Gulf Sales Engineer. You will find him always "on call" at your nearest Gulf office.

A copy of the informative Gulf booklet, "Lubrication and Maintenance Guide for Contractors' and Allied Equipment," will be sent you upon request.

Send now for your copy of this helpful booklet!

Gulf Oil Corporation · Gulf Refining Company

1822 Gulf Building, Pittsburgh 30, Pa. RLC

Please send me, without obligation, my free copy of the new revised edition of "Lubrication and Maintenance Guide for Contractors' and Allied Equipment."

Name.....

Company.....

Title.....

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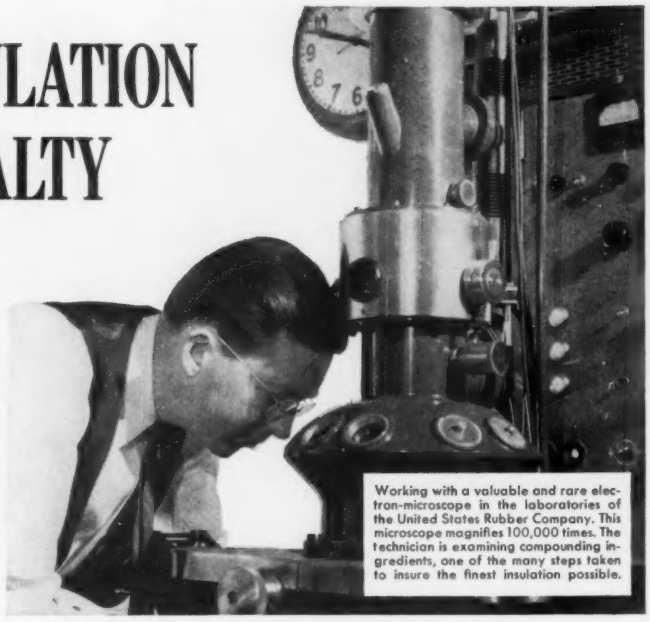
ELECTRICAL INSULATION IS OUR SPECIALTY



Working with a valuable and rare electron-microscope in the laboratories of the United States Rubber Company. This microscope magnifies 100,000 times. The technician is examining compounding ingredients, one of the many steps taken to insure the finest insulation possible.

Q. *What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?*

A. UNITED STATES RUBBER COMPANY.

Q. *What ONE wire and cable producer makes plastics?*

A. "U. S."

Q. *What is the most important part of wire and cable?*

A. The insulation.

Q. *Who is best equipped to make wire and cable with superior insulation?*

A. U. S. RUBBER—which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U. S. Rubber has been a pioneer in insulation for over 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U. S." specialty!

Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U. S. Rubber.

SOME MORE OF THE MANY DIFFERENT VARIETIES OF "U. S." WIRE AND CABLE

RAILROADS: Power Cables • Communications • Railway Signal • Royal Cords • Welding Cable • Railway Utility • Sup. Control • Weatherproof

UTILITIES: Power Cables • Street Lighting • Royal Cords • Network Cables • Utility Control • Pole & Bracket Cable • Service Entrance • Weatherproof • Zip Cord Pole Fixture Cable • Sup. Control

HEAVY INDUSTRY: Power Cable • Royal Cords • Welding Cables • Control Cables • Machine Tool Wire • Building Wire • Switchboard Wire • Thermostat Cable • Bus Drop Cable

ONE OF MANY SUPERIOR "U. S." WIRE AND CABLE PRODUCTS

USKORONA-NEOPRENE POWER CABLES

Ozone-resistant for high-voltage applications in wet or dry locations.

"U. S." USKORONA-NEOPRENE POWER CABLES offer to the exacting railway industry an unbeatable reliability on overhead and underground high-voltage power applications on circuits up to 8000 volts between phases and at conductor temperatures up to 75 C. They will not crack after 3 hours in air containing .015 per cent ozone. Light in weight, easy to install and join, resistant to oil, heat, sunlight, flame, acids, alkalis and corrosive chemicals. USKORONA-NEOPRENE cables also eliminate electrolysis. The following are guaranteed test values:

PHYSICAL AND AGING PROPERTIES (MINIMUM VALUES)

	Uskorona			Neoprene Jacket	
	Unaged	After 96 Hrs. O.B.	After 7 Day Geer Oven	Unaged	After 96 Hrs. O.B.
Tensile Lbs./Sq. In.	500	450	450	1800	1600
Elongation Per Cent	250	200	200	300	250

MOISTURE RESISTANCE (MAXIMUM VALUES)

Dielectric Constant and Power Factor of the insulation after immersion in water at 50 C.: Dielectric Constant, one day is 4.5; per cent gain, 1 to 14 days is 5.0; per cent gain, 7 to 14 days is 2.0; Power Factor, per cent, one day is 3.0; Stability Factor 40-80 volts/mil two weeks, per cent is .5.

U.S.RUBBER
SERVING THROUGH SCIENCE

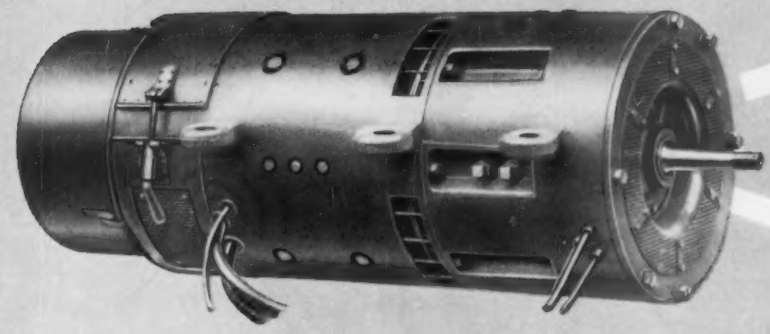
UNITED STATES RUBBER COMPANY

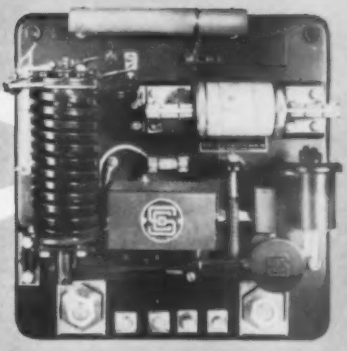
ELECTRICAL WIRE & CABLE DEPT. • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

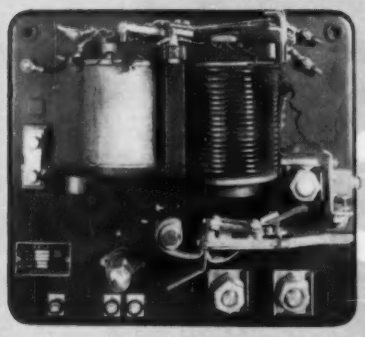
"Safety"

GENEMOTOR EQUIPMENT

An Unsurpassed Power Plant for Modern Passenger Cars...







COMBINING...

CONSTANT CURRENT LIMIT REGULATION... lengthens battery life...provides full genemotor output at low speeds for adequate battery charging ...prevents overcharging

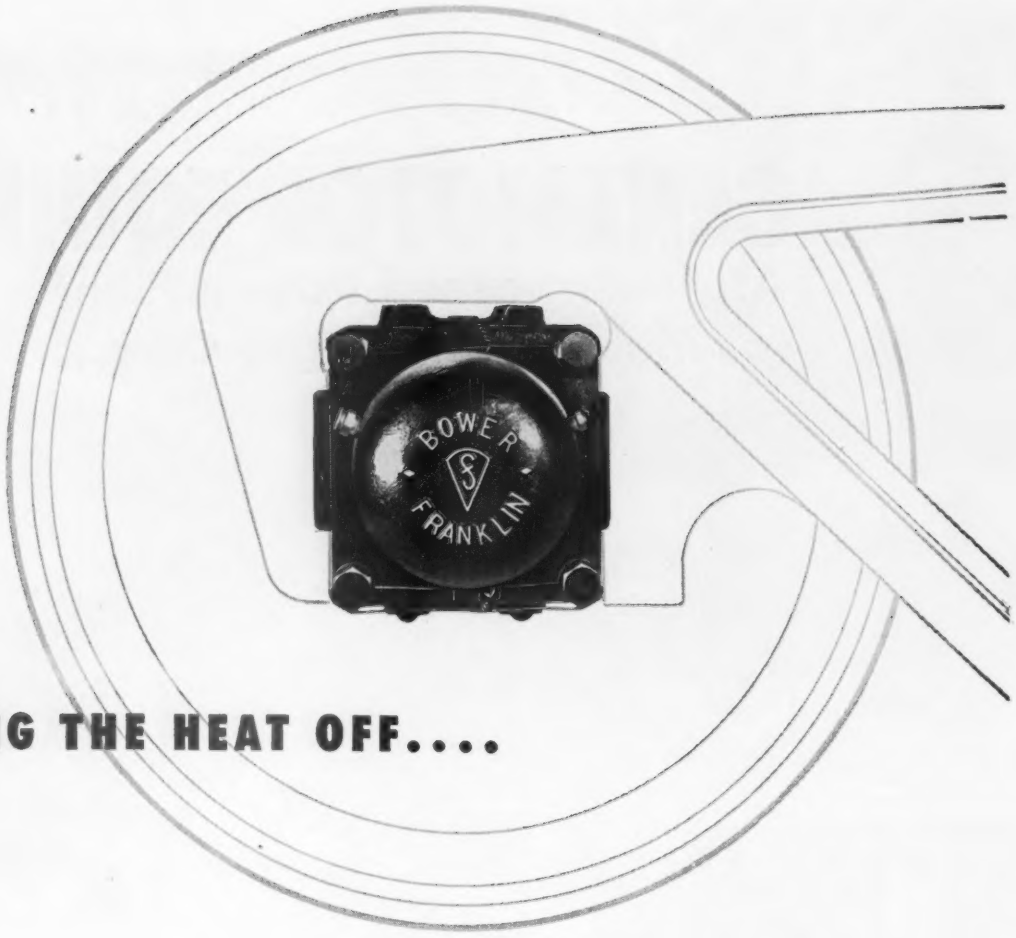
DEPENDABILITY... engineered to meet all exacting operating conditions

SIMPLICITY OF MAINTENANCE... uncomplicated automatic "Safety" control equipment...plus a "Safety" genemotor, precision manufactured for long life...a combination that reduces maintenance costs to a minimum

THE **SAFETY** CAR HEATING AND LIGHTING **COMPANY** INC.

NEW YORK · CHICAGO · PHILADELPHIA · ST. LOUIS · SAN FRANCISCO · NEW HAVEN · MONTREAL

SAFETY COMPANY PRODUCTS INCLUDE: Air-conditioning Equipment • Genemotors • Generators • Fans • Regulators • Blower Units Lighting Fixtures • Switchboards • Luggage Racks • Motor Alternators • Dynamotors • Motor Generators • Dual Voltage MG Sets



TAKING THE HEAT OFF....

Bower-Franklin journal boxes, equipped with dependable Bower straight roller bearings, are ready to help you carry more freight — at greater speeds — with no danger of hot boxes.

These high-quality bearings have already *proved* themselves in numerous other types of heavy-duty equipment — steel rolling mills, heavy trucks, earthmovers, cranes, shovels, and railroad generator-drive units, to mention but a few.

Sales and application engineering for the Bower-Franklin journal boxes are being handled by the Franklin Balmar Corporation. Additional information will be furnished on request.

FRANKLIN BALMAR CORPORATION

FRANKLIN BALMAR CORPORATION
WOODBERRY, BALTIMORE 11, MARYLAND
CHICAGO OFFICE: 5001 North Wolcott Ave., Chicago 40

DOW CORNING
SILICONES

give motors more muscles

Rewound with Class H at a saving of $4800, intermittent-duty crane motors give continuous service

With the development of better methods for charging furnaces, 3 yard cranes in a large foundry were used to feed the cupolas in addition to normal yard work. As the work load became more continuous, armatures started to burn out in the Class A insulated dc hoist motors rated at 60 hp at 395 rpm for 50% intermittent duty.

The motors were then rewound with Class B insulation. But the work load continued to increase until the cranes were working constantly, 16 hours a day. With 3 cranes in service, motors failed at the rate of one every other week. Rewind costs mounted to $800-$1000 a month.

Then in July, 1952, one of the hoist motors was rewound with silicone (Class H) insulation at a cost of $800. That motor is still in service and both of the others have been Class H insulated to give continuous service without failure. New continuous duty mill-type motors would have cost $7200. Rewinding with Class H cost $2400. Savings, $4800 plus.

And that's why top management men as well as production and maintenance engineers are demanding silicone (Class H) insulation. It gives motors, transformers and solenoids as much as 50% more overload capacity, and about 10 times the service life of equipment built with the next best class of insulating materials. Now is the time to increase efficiency; cut overhead and maintenance costs.

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

mail this coupon today!

Dow Corning Corporation, Dept. S-14, Midland, Michigan

Please send me

- ☐ More performance data on Class H
- ☐ List of Class H rewind shops
- ☐ List of Class H Motor and ☐ Class H Transformer Manufacturers
- ☐ "Tall Tales and Fabulous Facts" about silicone products

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

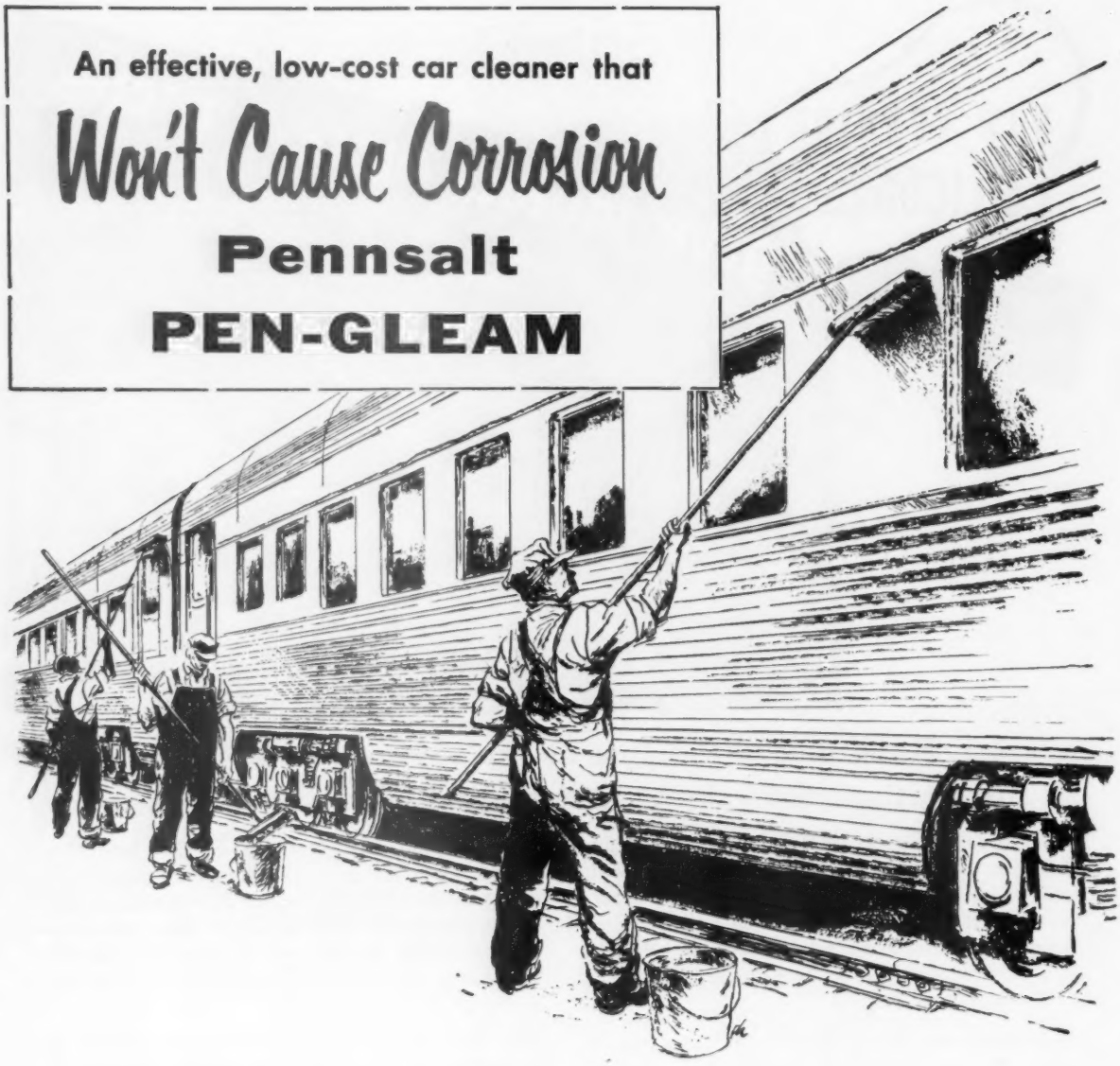
ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D.C. (Silver Spring, Md.)
In Canada: Dow Corning Silicones Ltd. • In England: Midland Silicones Ltd.

An effective, low-cost car cleaner that

Won't Cause Corrosion

Pennsalt

PEN-GLEAM



FOR "special" trains that must be clean and bright *all* the time, Pennsalt offers a special cleaner — Pen-Gleam. It can be used regularly and frequently *without* harm to paint or metal.

Pen-Gleam is a mildly alkaline compound containing relatively large proportions of wetting agents and water-softening ingredients. It is economical to buy and use (only 1-2 oz. per gal.); works well in hard or soft water; dissolves quickly and completely even in cold water.

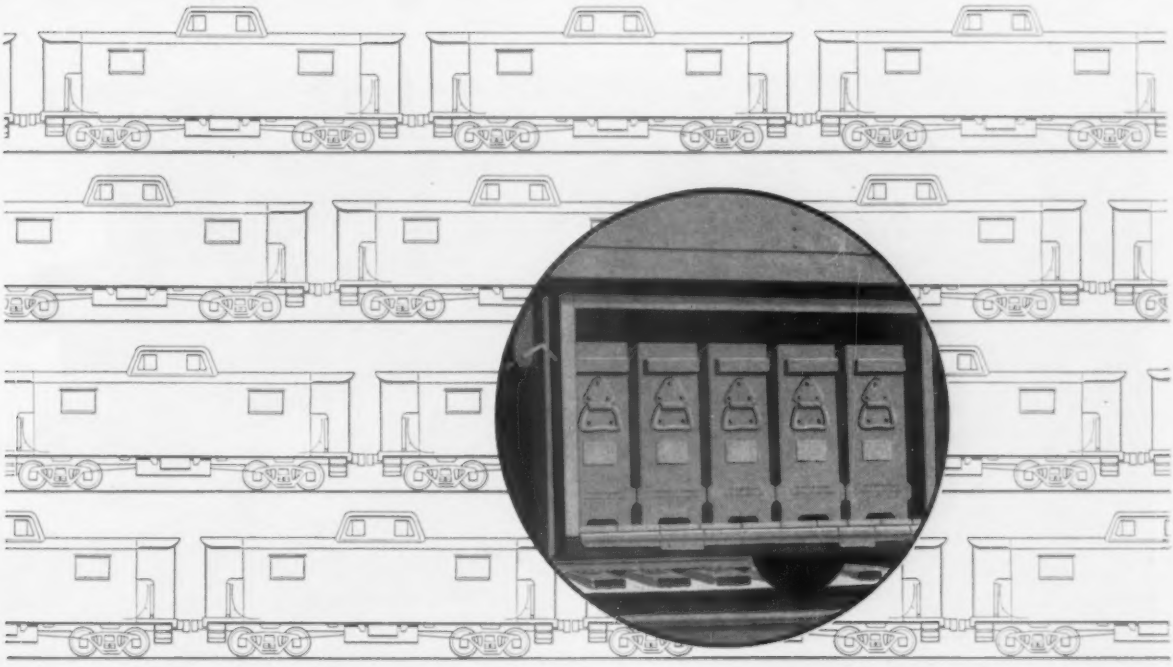
This efficient cleaner rinses fast and free from paint, metal, or glass; will *not* attack paint at use concentrations; is easy on worker's hands. Under the name "Cleaner 85" it has long been used by leading roads for washing diesel locomotives.

To users, Pennsalt recommends that cars be given a periodic acid wash to remove accumulated oxide film, and then returned to a Pen-Gleam washing cycle. Pen-Gleam will do an excellent job of maintaining a car's like-new appearance if it is used regularly. It is also highly recommended for washing coach interiors, and as a general building-maintenance cleaner.

Like To See For Yourself? The only way to thoroughly evaluate this non-corroding cleaner is to test it on one or more of your road's cars. A Pennsalt Representative will arrange such a demonstration at your convenience. Or, we'll be glad to send you further product information. Write: Maintenance Chemicals Dept., *East:* Pennsylvania Salt Mfg. Co., 466 Widener Bldg., Phila. 7, Pa. *West:* Pennsylvania Salt Mfg. Co. of Washington, 2168 Shattuck Ave., Berkeley 4, Calif.

Pennsalt Chemicals

For either freight or passenger-train cars . . .



. . . Railroads can depend on EDISON Batteries!

STEEL-BUILT FOR MAXIMUM DURABILITY—EDISON Batteries have proved their ability to withstand severe mechanical shocks incidental to all types of railway-car operations, including freight-train caboose cars, in installation after installation. EDISON'S high-strength steel cells and steel plates provide exceptional mechanical durability.

HIGH ROAD CAPACITY—EDISON Batteries have no prescribed discharge limits and therefore operate self-regulating inversion equipment correspondingly longer. Recovery after discharge is as rapid as generator output permits resulting in high road capacity and virtual elimination of yard charging.

SUCCESSFULLY MEET ALL TEMPERATURE EXTREMES—EDISON battery life is not affected by the extreme cold of wintertime Canadian or Alaskan train operations—or by the tropical heat which earmarks Mexican operations. Even under such extremes, EDISONS give dependable performance and extremely long life.

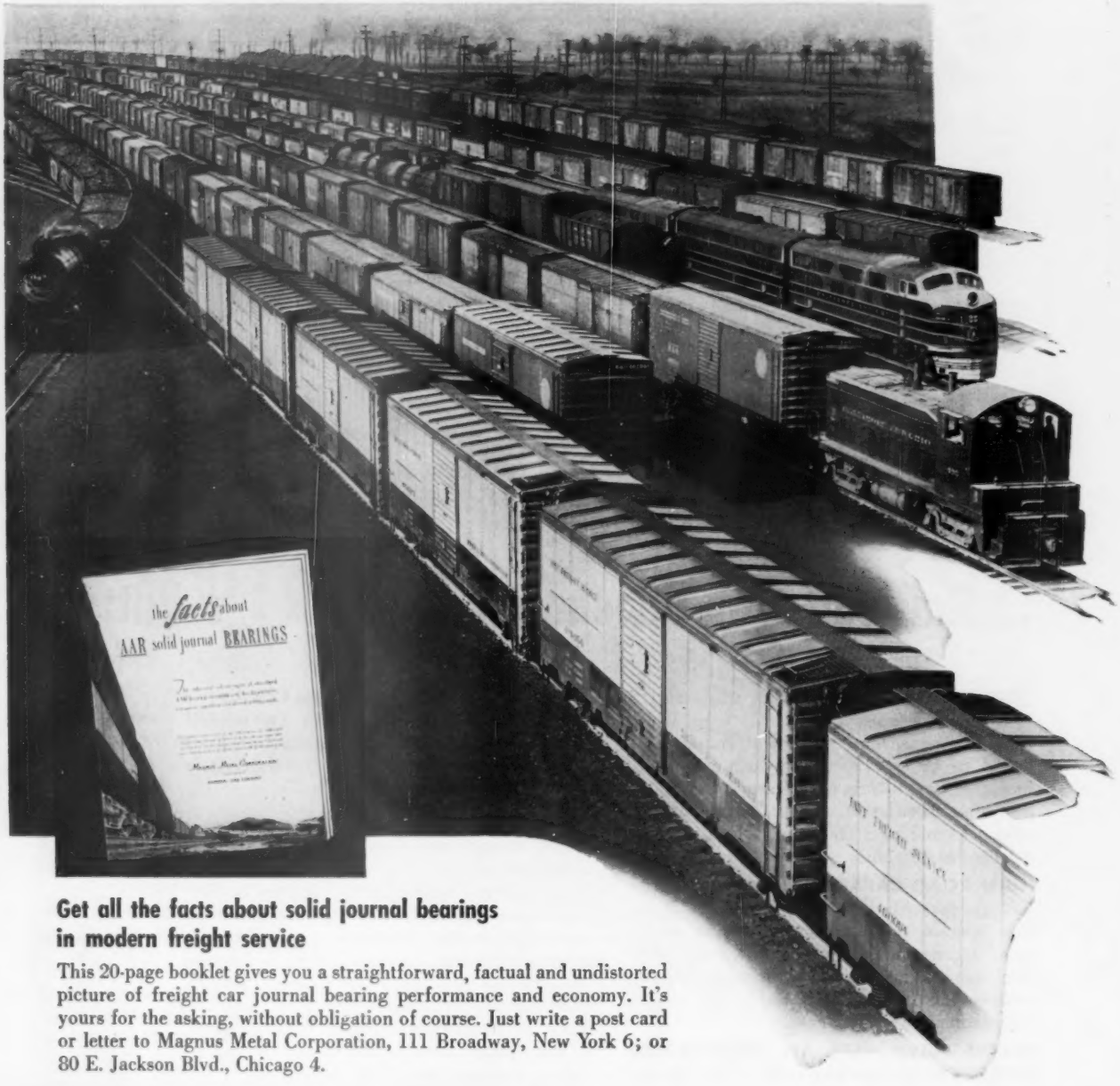
LOWEST OVER-ALL COST—An entire year's record of roads operating more than 2,000 batteries showed that all batteries replaced averaged 18 to 25 years. Such long life, plus low maintenance costs, makes EDISON Batteries the most economical source of stand-by power for both passenger-train cars and cabooses. Make sure you have the latest details on EDISON batteries today—write for Bulletin SB 3208 and the name of the nearest Edison field engineer. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N.J.

Most Dependable Power—
Lowest Over-all Cost
. . . you get both with an EDISON

EDISON
Nickel · Iron · Alkaline
STORAGE BATTERIES

EDISON ALSO MAKES THE FAMOUS "V.P." VOICEWRITER AND THE TELEVOICE SYSTEM

Here's why railroads get MORE



Get all the facts about solid journal bearings in modern freight service

This 20-page booklet gives you a straightforward, factual and undistorted picture of freight car journal bearing performance and economy. It's yours for the asking, without obligation of course. Just write a post card or letter to Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

Freight Car Bearing Performance

THE figures at the right clearly indicate a trend to improved journal bearing performance, even with today's faster train speeds and heavier loads. Performance will improve still further with higher standards for maintenance and car servicing.

Properly serviced and maintained, the solid bearing is capable of accelerating as rapidly and running as fast as practical operating limits will ever permit.

PERIOD	TOTAL CAR MILES	CAR MILES PER HOT BOX
1951	34,726,490,070	172,703
1952	34,313,975,558	190,109
1952 (1st 6 Mo.)	16,934,609,076	212,882
1953 (1st 6 Mo.)	17,149,062,399	237,334

FREIGHT REVENUE

per car dollar invested

...with LOW-COST SOLID BEARINGS

You get up to 20% more cars for your money when they're solid bearing equipped. That's 20% more hauling capacity for the same initial investment—plus a proved daily efficiency of 99.97% even with cars averaging 20 years old!

A SOLID bearing freight car earns just as much as one with any other kind of bearings—and it costs up to 20% less, too! These are facts. They add up to just one thing—the biggest possible return for each freight car dollar you spend. And you need that big return because, *for reasons entirely apart from the type of journal bearing installed,* a freight car has to earn its way in less than three hours a day.

Now what about maintenance and operating expense? Well, here's a question you can answer in part for yourself. Just take a good look at the passenger equipment you operate. Chances are some portion of your passenger cars have other than solid-type journal bearings installed. And if you figure in all your costs—the extra tools and facilities, the skilled labor and time, and inventories required, you'll see that you're better off with solid bearing cars where maintenance costs are concerned.

Bearing Efficiency and Operating Expense

So it becomes a question of bearing efficiency and daily operating performance. Well, here the facts about solid bearings are known. Throughout the year there's less than one failure for each 4,000 cars per day—an efficiency index of better than 99.97%, even though the cars average over 20 years old. New solid bearing freight cars do even better—often go millions of car miles without a bearing failure.

How to Lick Hot Boxes

Of course, this doesn't mean that hot boxes are not still a problem. But you can lick this problem best with low-cost solid bearing designs. Heat-resistant lining metals and low-cost alarms are already available. Improved lubricating methods are being developed. Combine these improvements with *an intensified program to upgrade maintenance standards,* and hot boxes will virtually disappear.

Then, too, you'll still have all the other advantages which solid bearings bring to railroad rolling stock. You can take the maximum load, make the fastest schedule. You'll save an average of 1,000 pounds per car and get the smoothest (and quietest) ride on any standard truck. But best of all, you'll be sure of the best possible bearing performance at the lowest possible cost.

MAGNUS

Solid Bearings

Right for Railroads

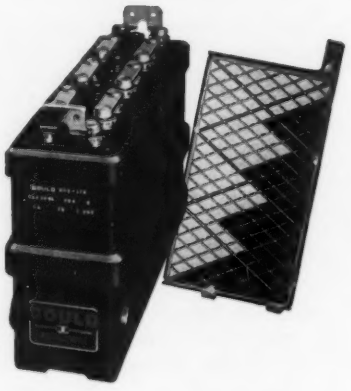
...in performance...in cost

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

LASTING POWER for Diesel Cranking

THANKS TO BATTERY POWER!

From cover to container, the Gould Kathanode is completely engineered for diesel starting. That's why it's built with extra reserve power for fast breakaway torque and continued cranking to firing speed in any weather. Kathanodes are standard equipment on many of America's finest railroads. For the heavy current drains required in winter-weather diesel starting, there's *no* battery power like Gould Kathanode power.



Specify
GOULD KATHANODE
BATTERIES
with New Diamond "Z" Grids
for Diesel Starting

GOULD *RAILROAD BATTERIES*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

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for the man

...ON TRACK
...IN THE SHOP

10 Helpful Booklets

use coupon below to order by number

Suburban Track Gets "Ribbonrail"
Transport Methods for Welded Rail
90 Miles of Continuous Welded Rail
Progress in Rail Pressure Welding
Ribbonrail
Oxy-Acetylene Welding and Cutting as Applied to Railroads
SPEEDS COUPLER RECLAMATION
New Railway Car-Building and Repair-Shop Methods
Welding at the Railroad Reclamation Plant

For the engineering department and others interested, five reprints are on continuous rail and OXWELD'S RIBBONRAIL Service.

1 "Suburban Track Gets RIBBONRAIL"—the laying and use of continuous rail in busy Chicago suburban traffic.

2 "Transport Methods for Welded Rail"—answers many questions on how continuous rail is transported and laid.

3 "Crop, Weld, Saw—Secondhand Rails for New Yard"—shows how an Eastern railroad prepared and welded rail into longer lengths for a new switch yard.

4 "90 Miles of Continuous Welded Rail"—important facts on welded rail engineering and economics from a railroad that has wide experience with RIBBONRAIL Service.

5 "Progress in Rail Pressure Welding"—an 8-page reprint of a technical paper delivered at a national meeting of the American Welding Society.

The terms "Heliarc" and "Unionmelt" are registered trade-marks and "Ribbonrail" is a service-mark of Union Carbide and Carbon Corporation.

Use the coupon below to get any or all of these *free* booklets. Be sure to designate the booklets you want by circling the numbers on the coupon.

FILL OUT AND MAIL

For railroad men responsible for car and locomotive maintenance and also car construction, the five booklets described contain many new ideas on using HELIARC, sigma, UNIONMELT, and oxy-acetylene welding.

6 "Oxy-Acetylene Welding and Cutting as Applied to Railroads"—a technical paper written by the welding supervisor of a large southern railroad. Covers car and diesel locomotive practices.

7 "Reclamation of Diesel Engine Parts by HELIARC Welding"—repairs of many types of diesel parts—aluminum, stainless, cast iron—are given in this 10-page reprint.

8 "A New Method of Electric Welding Speeds Coupler Reclamation"—a large Midwestern road has adopted UNIONMELT welding to reclaim worn couplers more efficiently.

9 "New Railway Car-Building and Repair Shop Methods"—latest wrinkles in car-building by UNIONMELT welding and also valuable information on HELIARC and sigma welding.

10 "Welding at the Railroad Reclamation Plant"—how a Midwestern railroad that reclaims 175 different parts uses the oxy-acetylene process to make worn parts usable.

Oxweld Railroad Service Company
Room 1320, 230 North Michigan Avenue
Chicago 1, Illinois

Gentlemen:

Please send me the booklets which I have circled.

1 2 3 4 5 6 7 8 9 10

NAME..... POSITION.....

RAILROAD.....

ADDRESS.....

Circle the numbers of the booklets you want. If you want more than one copy please indicate.

Alco All-Purpose Locomotives Lead the Way to Higher Earnings Through Greater Versatility

Better utilization—which demands greater versatility—is the modern means to greater railroad earnings . . . and Alco all-purpose locomotives *are your most versatile form of motive power.*

Combining the exceptional visibility of standard Alco switching units with high tractive-effort capacity for hauling heavy trains and full horsepower at high speeds, Alco all-purpose locomotives *are unmatched for versatility.*

Alco all-purpose locomotives *haul more tons per train* on your fastest freight and passenger runs. They handle *all* of your transfer, branch-line, and yard-switching assignments, and thus allow you to obtain up to 95 per cent utilization.

Versatility Means Lower Costs

Alco all-purpose units also enable you to make drastic cuts in your first costs, operating costs, and maintenance costs.

For example: the Alco 1600-hp 4-motor unit handled essentially the same main-line service as a standard 1600-hp road freight unit—*at a first cost saving of more than $10,000.*

The greater pulling power of Alco all-purpose locomotives —at *all* speeds—means more tons per train on your toughest jobs. And "more tons per train" means lower fuel costs, lower repair costs, lower lubrication costs, lower crew costs, and lower investment—per ton hauled.

Today's all-purpose locomotives are direct descendants of the original "road switcher" design introduced by Alco in 1940—a new concept in railroad motive power that has since become standard throughout the country—imitated but never duplicated. Alco all-purpose units are engineered by *specialists to give you better motive power for greater earning power.*

Special Features

Alco 1600-hp all-purpose locomotives give you the following high-performance features:

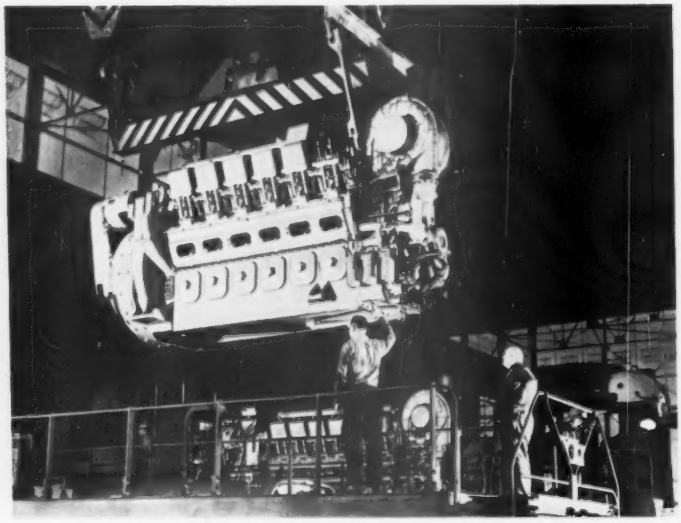
★ Full rated horsepower at high speed and at altitudes up to 8,000 ft—for faster schedules, heavier payloads.

★ 4-cycle, turbocharged engine—for greater fuel economy, better scavenging, better cooling of valves and valve seats.

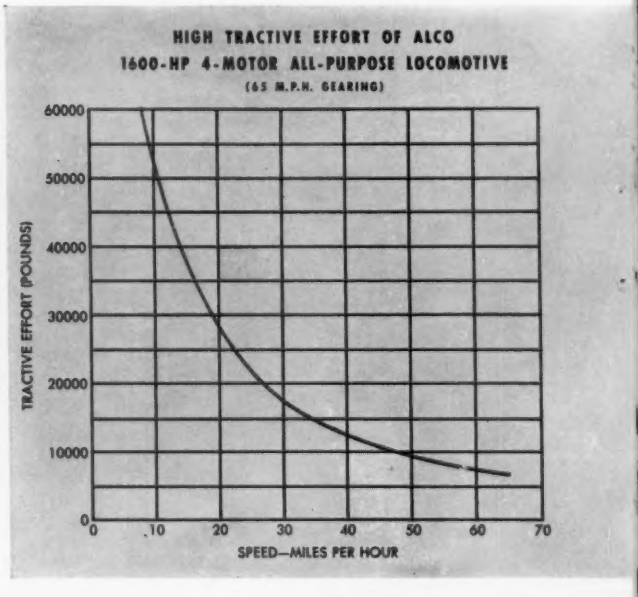
★ Maximum speeds up to 92 mph.

★ High-capacity, automatically controlled dynamic braking – where required – for greater speed control on flat terrain, greater holding power on grades.

★ Superior traction motors provide highest continuous tractive effort . . . 53,000 lb for 4-motor, 79,500 lb for 6-motor – with 65-mph gearing.



Dependable Alco 4-cycle engine is readily accessible from both top and sides, and can easily be removed for major overhaul.



Alco AMERICAN

Two of the Reading's fleet of 67 Alco 1600-hp all-purpose locomotives.

How Alco All-Purpose Locomotives Help Boost Reading's Operating Efficiency

Increased dieselization of motive power during 1952 and 1953 has been the vital factor in saving the Reading Company approximately 20 cents per thousand gross ton miles—or about $3,000,000 annually—represented by a reduction in operating ratio from 79.33 to 76.52 per cent.

"An important reason for this increased efficiency," says Mr. J. A. Fisher, Reading president, "was the high productivity of our all-purpose locomotives."

"As the Reading moves forward with its dieselization program," Mr. Fisher adds, "we look forward to greater efficiencies and lower operating ratios from our all-purpose locomotives."

Investigate soon how Alco all-purpose locomotives can bring proportionate savings to your own road.

The first step: contact your nearest Alco locomotive representative.

LOCOMOTIVE COMPANY

Sales and Service Offices in New York, Chicago, Cleveland, St. Louis, San Francisco, and Washington, D. C.

Newer, more positive method of flange lubrication

INCREASES MILEAGE BETWEEN WHEEL TURNINGS up to 40%

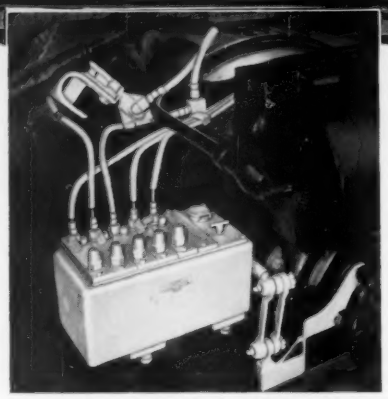
. . . reduces rail wear, too!

MAGNUS D-16 FLANGE LUBRICATOR

offers all these important features

- *Positive, controlled-pressure flange lubrication*
- *Six individually-adjustable pumps*
- *Also lubricates Center Pin Wear Plate*
- *Operates only when locomotive is moving*
- *No over-run on treads*
- *Sixteen pint capacity*

Recommended installation consists of one Magnus Type D-16 Flange Lubricator for each locomotive truck—using four outlets to lubricate all flanges and one outlet for center pin wear plate lubrication. With this arrangement, road locomotives can average over 1,000 miles and yard locomotives can operate six days without oil additions.



Close-up view of the above installation, showing D-16 Flange Lubricator mounted on truck frame, and connecting mechanical linkage to journal box. Flange head assembly and mounting bracket are visible at top left. Any movement of ¼" or more of truck frame with respect to wheels operates the ratchet drive of the lubricator and actuates all high pressure pumping units. Oil is delivered through copper tubing and flexible hose to Flange Head Assemblies—mounted at a 45° angle to wheel centers.

Equip your diesels with new Magnus Type D-16 Flange Lubricators and you extend mileage between wheel turnings up to 40%. Cut flanges of locomotives already in service smooth out quickly—in the first few hundred miles. Flanges of new locomotives stay smooth—won't cut or chafe. You save plenty on shop expense and "down time"—and you save on longer wheel life, too.

Each precision pump is individually adjustable with a single set screw. This means positive control of the amount of oil to each outlet point—makes it possible to provide maximum protection for flanges yet prevent oil from reaching the wheel treads. You also can deliver a smaller quantity of oil for positive center pin wear plate lubrication.

Write for complete information.

Magnus Brass
Manufacturing Company
Subsidiary of NATIONAL LEAD COMPANY
525 Reading Road, Cincinnati 2, Ohio

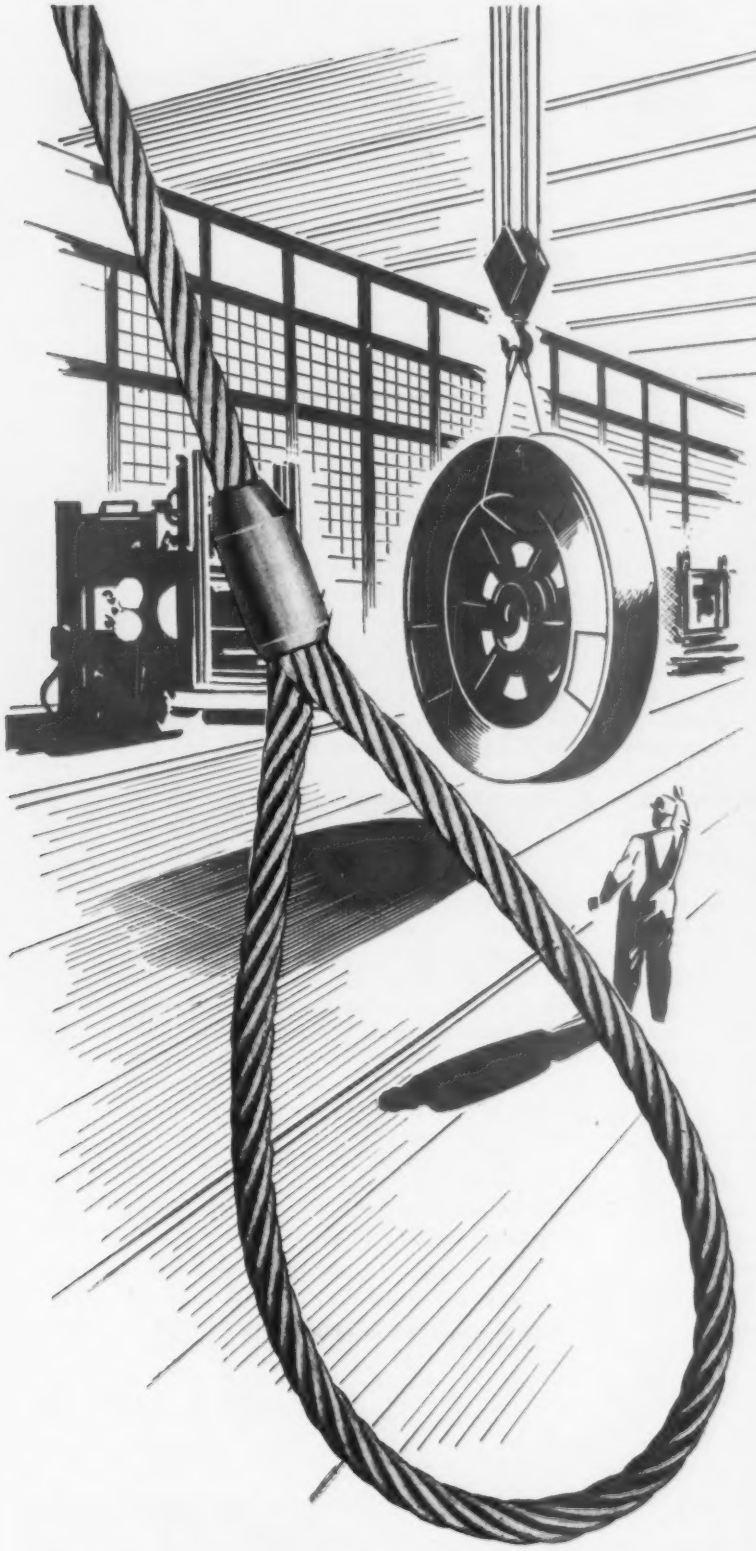
other Magnus Brass products for diesel locomotives

SAFETY VALVES for DIESEL STEAM GENERATORS

Easy accurate adjustment for opening and blow-down pressures. Prevent escape of steam into steam generator compartment.

SIGHT GAGES for DIESEL FUEL TANKS

Flexible mounting to fit all standard diesel fuel tanks. Leak proof and practically indestructible.



SAVE SLING DOLLARS

Roebling Tapered Sleeve Slings cost less than spliced slings

READY TO USE, Roebling Tapered Sleeve Slings not only do away with inefficient, time-consuming hand splices, they are easier to handle, more economical, and above all, they are SAFER!

Their flexibility, clean lines, and sleeve locked grip insure ease of handling and absolute safety on the job. They are as strong and dependable as the rope itself.

Write for literature or ask for a Roebling sling specialist to advise you.

ROEBLING
A subsidiary of The Colorado Fuel and Iron Corporation

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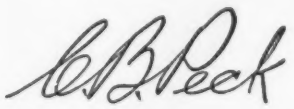
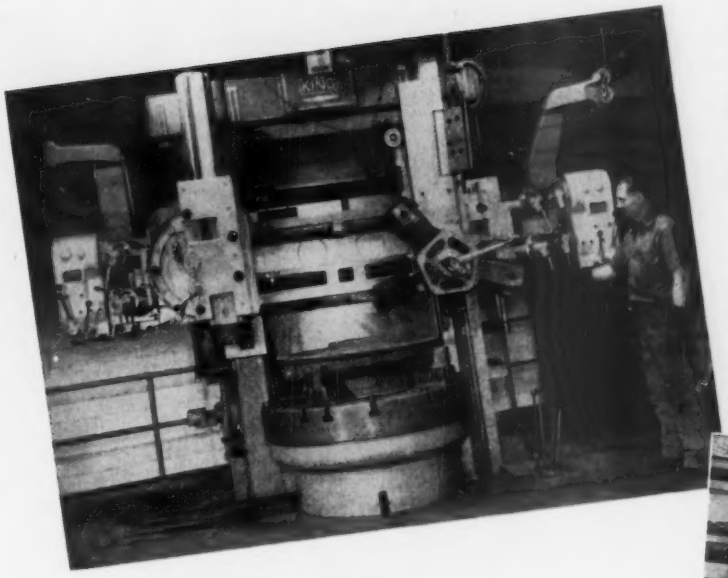
Effective Men Do Not Just Happen

In an address discussing the problems of administering safety-appliance regulations under the federal laws which he delivered before the Southern and Southwestern Railway Club on January 21, S. N. Mills, director of the Bureau of Safety of the Interstate Commerce Commission, said: "We of the Bureau of Safety take great pride, which I think is entirely justifiable, in the part we have played, by the administration of railroad safety legislation, in increasing the safety of railway employment and travel. Nevertheless, I am impressed by the fact that safety cannot be provided by legislation alone. The law may specify standards for safe equipment, but no safety device can equal a safe man. And safe men do not just happen. They are developed by instruction, training, supervision and example. The attitude of a man toward safety matters often reflects the attitude of his immediate superior, and this is true of all levels of the railroad organization."

The importance of "instruction, training, supervision and example" to the success of railroad operation goes far beyond the administration of safety, important as that is to the railroad, its patrons and its employees. These measures are important in the improvement of public relations, particularly by the inculcation of the principles and practice of courtesy. They are important in the improvement of employee relations, starting at the top and working down through every level of supervision, none of whom must ever forget the crucial value of example. No rule of conduct, or performance which the immediate supervision is willing to overlook is likely to be observed by the men for whom it is written. This applies even to the quality of work performance. If the supervisor is satisfied with anything less than a thorough job, meticulously done, the quality of the workmanship for which he is responsible will deteriorate. If the management is not willing to support the local supervision in seeing that journal boxes, for instance, are adequately inspected and serviced in train yards, hot boxes will be on the increase.

The quality of every aspect of railway performance is determined by the quality of the individual performance of many persons. The standard of quality attained by the individual, within his capacity, is dependent to no small degree on the quality of the instruction and training to which he has been subjected. On a railroad where men are less closely supervised than in almost any other industry, the character of the supervisor is as important as his skill. It is this which makes his influence felt without his actual presence. It is the personal example, starting at the top and passed down through each level of supervision, which determines the spirit with which the men who do the work carry out their assignments. On this spirit depends the standard of performance attained by the organization as a whole.





DIESEL LOCOMOTIVE WHEELS

The KING Vertical Boring & Turning Machine at left—a modification of our standard 52" design—is used for boring, facing, and turning operations on Diesel locomotive wheels. Operations performed include trueing outside diameter, facing off hub, turning hub for dust guard, rough and finish boring, etc.

MULTIPLE BEARING CROSSHEAD

Below is a close-up view of a 42" KING in a back shop of a prominent Eastern railroad. Operator is cutting radius on a locomotive multiple bearing crosshead—one of many important maintenance jobs performed on this versatile machine.

Whatever YOUR MAINTENANCE REQUIREMENTS

KING VERTICAL BORING & TURNING MACHINES

DELIVER *MAXIMUM PRODUCTION* AT *LOWEST COST*

The modern KING® line of vertical boring and turning machines meets all railroad requirements, large and small—for special purpose work such as Diesel locomotive wheel production—for general purpose work machining a wide range of railroad maintenance jobs.

From the 30" to the 144" size, each of these new KINGS is extremely versatile in its own capacity range. Each model has extra-heavy, rigid construction; smooth power; wide range of speeds and feeds; time-saving ease of control—all of which are recognized essentials for fast, precision work.

To speed your maintenance schedules and get the highest availability from your locomotives, put new KING mills to work in your shops. You'll get rapid production, coupled with dependable accuracy, on your railroad maintenance jobs. Investigate these performance proved "top profit" machine tools for your modernized maintenance program.

●

KING MACHINES ARE MADE IN 10 SIZES—30", 36", 42", 52", 62", 72", 84", 100", 120", 144".
Wide Variety of Head Combinations.

American Steel Foundries

KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE — CINCINNATI 29, OHIO

EDITORIALS

A Tribute to Car Men

In addressing the December meeting of the Car Foremen's Association of Chicago, W. M. Keller, A.A.R. director of mechanical research, paid a tribute to railway carmen which is well deserved and should encourage them to still more faithful performance of duties often arduous and performed under the most difficult climatic conditions. Car inspectors, for example, have full responsibility for cutting cars out of trains or running them to the next terminal. Cars sent to the repair track, either loaded or empty, are reconditioned often in a surprisingly short time and almost always with simpler tools than any other kind of craftsman would consider indispensable. All the car foreman has to do is supervise all of these operations, make sure nothing is overlooked, educate, encourage and discipline his men, check material needs, keep costs down and production up.

The prompt handling of repairs to standing trains takes ingenuity and resourcefulness, as indicated by the following instance of what happened to a passenger train, as described by Mr. Keller: "I was on a train that developed a slightly overheated journal on the club car and as I saw the car men move to the car with their track jack, replacement bearing, oil can, packing and a few other tools, I reflected that we would leave the station about a half hour late. You know what happened! The box was jacked, bearing removed, journal examined and new bearing installed. After the box was packed and oiled generously, we left five min. late and arrived at the next terminal 130 miles away on time with a cool journal."

Equally striking performance, on a somewhat different scale, is frequently demonstrated in repairing loaded freight cars which have developed defects. In many instances, these defects are repaired in time for the cars to make their original connections. Car men have indeed an important role in organizing their efforts with the ultimate objective of eliminating delays due to car defects.

A Problem and an Opportunity

One of the major problems confronting the railroad industry—and one toward the solution of which the mechanical department can make a substantial contribution—is the continuing pasenger service deficit. How can the mechanical man contribute toward its reduction or elimination? One way is by applying his knowledge to improving the design and the second is by keeping an open mind toward ideas advanced by others.

One easy way to see that there is room for improvement in design is to compare what the railroads receive for doing a basic unit of work in passenger service with what they receive for the same unit in freight service. A good basic unit for this comparison is the revenue received per gross ton mile for each service.

Last year the railroads actually received *more* for performing a gross ton mile of freight service than for performing a gross ton mile of passenger service. For freight service the figure was .83 cents per g.t.m., while in passenger service it was but .70 cents.

Here is how these figures were computed. The average

passenger car in 1953 carried 17.8 passengers at an average revenue of 2.653 cents per mile, a total revenue of 45.22 cents per car mile. If an average car weight of 65 tons be assumed, the money received by the railroad per g.t.m. is 45.22 cents divided by 65 tons, or .70 cents per gross ton mile.

In freight service the average car carried 32.2 net tons at an average revenue of 1.479 cents per net ton mile, or a toal revenue of 47.62 cents per car mile. Adding an estimated 25 tons for the average light weight of a car, we find that the railroad received 47.62 cents for moving 57.2 tons one mile. This amounts to .83 cents received for performing a g.t.m. of freight service.

Thus we have the rather silly situation in which the railroads receive .83 cents per g.t.m. for performing freight service, but get only .70 cents per g.t.m. for performing the far more expensive passenger service. Is it really hard to understand one big reason why the money is in freight business?

Unfortunately the situation is getting worse instead of better. For 1952, the figures were .75 cents per passenger g.t.m. and .80 cents per freight g.t.m. It would seem to be high time that something were done to arrest and reverse this trend. Proof that something can be done about this millstone of excessive weight around the passenger department's neck already exists in the form of the Talgo and modern European lightweight equipment, and is in the embryo stage in Train X.

Lighter weight will admittedly not be a cure-all for the passenger deficit problem, but it can make a substantial contribution toward its solution. It will have no effect on crew costs, terminal costs and the like. But—if properly designed—lightweight equipment should be cheaper to buy, cheaper to operate and cheaper to maintain.

Where mechanical men have legitimate objection to certain features should they not make positive recommendations to overcome these objections rather than to condemn new designs that offer large potential savings? It may usually be assumed that a man who condemns something without being able to offer a substitute suggestion does not know enough about the thing he condemns to have condemned it at all.

This Could Never Happen to Miller

Years ago on our railroad, we employed a simple form of head-end train lighting in which power was derived from a 25-kw. steam-turbine driven-generator in the baggage car. It was necessary to have a train electrician ride the train to see that connectors between cars were put up and taken down when cars were taken out or put in the train. It was also his job to see that batteries on the cars were charged during the daytime. Work requirements for the electricians were very light, so for the purpose of keeping their hands in with tools, they were taken off the run periodically and give a turn in the shop. It was not a situation for developing high skills, but the method worked fairly well.

One of the electricians was a pompous little man, whom, for the benefit of the story, we will call Miller. Because of their using tools infrequently, some of Miller's coworkers would often break something. When this happened, Miller would look at the pieces, nod his head sagely and say, "Nah, dis could nefer happen to Miller."

It wouldn't be much later when Miller would have an accident, such as burning up a motor. Then Miller would look at the charred remains, again nod his head sagely, and say, "Nah, dis could happen to anybody".

This kind of defense mechanism is not peculiar to Miller. Anyone who is taken to task for having done something wrong is immediately put on the defensive and tries to work out a logical alibi. This very human characteristic makes it difficult to teach men by pointing out their shortcomings.

An answer to this problem, we believe, is included in a series of articles which is being started in this issue. The stories are all taken from actual happenings. That makes them vital. The secret of their presentation is that the thing always happens to someone else, so the reader never feels a sense of guilt, but is able rather to feel a sense of superiority. Will you, who have the problem of passing information along to someone else, tell us if you like this method of approach?

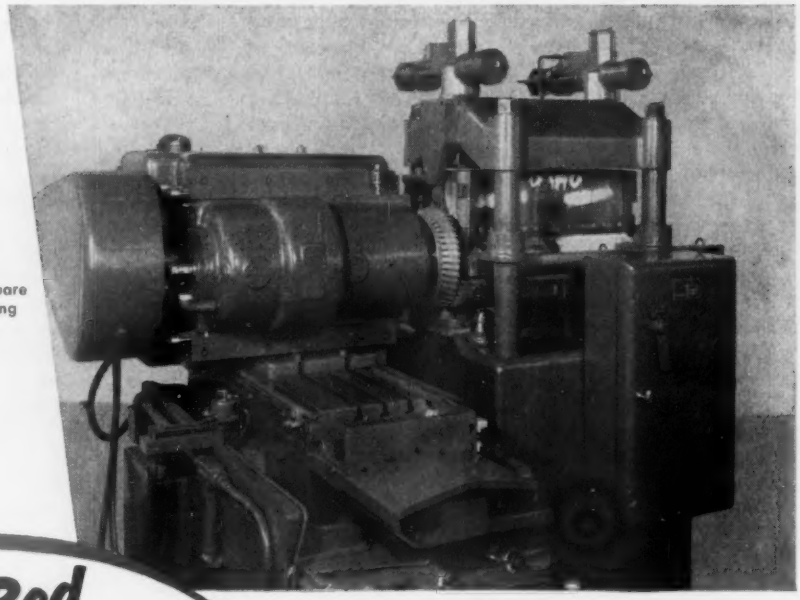
NEW BOOKS

QUESTIONS AND ANSWERS ON THE 24-RL LOCOMOTIVE BRAKE EQUIPMENT. *102 pages, 6 in. by 9 in., diagrams, paper bound. The Air Brake Association, Railway Exchange Building, Chicago 4. $3 or $2.50 in orders of five or more.*

The 24RL locomotive brake equipment is now accepted as standard for new freight and passenger locomotives on the American and Canadian railroads and has been for four or five years. In 1949 the Air Brake Association brought out a book with the above title which was written in question and answer form so as to be easily followed. This book proved to be popular and has now been completely reviewed, revised and necessary additions made to cover every part of 1953 locomotive brake equipment details. The books is intended especially for air brake foremen, inspectors, locomotive supervisors and crews.

PRODUCTION DATA:

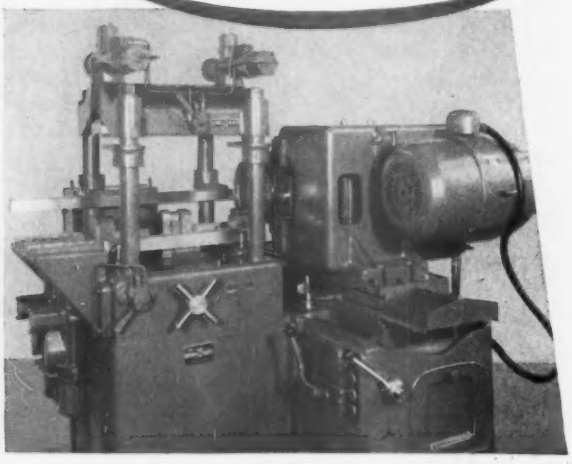
Part Name	Cylinder block
Material	Cast iron
Operation	Mill flywheel end square with crankshaft bearing
Cutting Speed	300 feet per minute
Feed	25" per minute
Production	30 per hour



Familiar units comprise this CINCINNATI special purpose miller. In this view, a cylinder block is clamped in position for the milling operation.

Hydromatic Bed and Dial Type Head

COMBINE FORCES TO MILL CYLINDER BLOCKS



Operator's working station, showing comparative simplicity of Hydromatic and Dial Type combination.

Unorthodox procedures sometimes work out to advantage. In this example, the work and cutter spindle head have been interchanged for an accurate milling operation on cylinder blocks. A lower unit cost resulted, and here are the reasons why. ¶The machine, basically a CINCINNATI No. 3-24 Hydromatic Miller, is equipped with a spindle carrier mounted on the table, and a "dummy" headstock which incorporates a conveyor height fixture. The spindle carrier may look familiar to you . . . with minor alterations, it's the standard vertical head of a CINCINNATI No. 3 Vertical High Power Dial Type. To reduce physical effort for the operator, the fixture is pneumatically operated. A 12" diameter sintered carbide cutter takes the cut at 25" per minute. ¶Cincinnati Application Engineers are expert at taking standard units of CINCINNATI Milling Machines and putting them together with a minimum of special work. Whether it's a tailor-made machine or merely a special unit, you can be sure of justifying your replacement policy with CINCINNATI handling your milling problems. May we hear from you?

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RAILWAY Mechanical and Electrical Engineer

Gas Turbines — And the Motive-Power Problem

An analysis of locomotive power and performance requirements of motive power in service with special reference to the gas turbine

By P. A. McGee

A ROUGH approximation of the generally applied power rating, that is, the horsepower per ton of the total transportation unit with the five industries indicates that automobiles may take up to 100 horsepower per ton where buses and trucks may take up to 30 to 25 hp. per ton.

In railroad service, rail cars whether operated by straight electric or diesel power, may take up to 8 horsepower per ton. With long passenger trains, the power may be from 3 to 5 horsepower per ton. In freight service however, railroad requirements are from one-half to 1½ horsepower per ton. Values for aviation, marine and pipe line service are merely indicated as a matter of interest.

The small horsepower per ton required in railroad service, results from the low rolling resistance between locomotive steel wheels and trailing car steel wheels and the steel rails. This basic rail condition should insure the continued use of railroads for mass transportation.

A locomotive is limited in its hauling capacity to a maximum tractive force of approximately 25 per cent of the weight on driving wheels. That is to say, a locomotive with four driving axles and 100 tons on these driving axles, can deliver a maximum tractive effort at the rims of the driving wheels, of approximately 25 tons. When in motion, and particularly at speeds in excess of 20 mph, experience indicates that the maximum tractive effort that can be consistently obtained without the excessive use of sand on dry rail, is approximately 18 per cent of the weight on driving wheels.

These two values are of great importance in applying a locomotive to a given service and they have led to the development of standard diesel locomotive units best suited to the permissible axle loads, clearances and general operating pattern of Class I railroads.

A point of interest is the small number of locomotive units and comparatively small horsepower required to operate 75 per cent of our railroads. Although the railroads had an average of 64,500 locomotives between 1921 and 1925, the indications are that approximately 32,000 modern units with an average weight of 125 tons, developing about 42,000,000 horsepower, would cover the total peak traffic of Class I railroads in war years.

The comparatively small inventory of locomotive units is explained by the efficient use of railroad power and the high transportation output per hour developed per locomotive unit.

With a representative number of railroads the following average use through a twelve-month period is obtained with diesel locomotives:

In passenger service average miles per locomotive month, 17,100.

In freight service average miles per locomotive month, 8,320.

In switching service average hours per locomotive month, 520.

With the same railroads, the average gross-trailing-ton-miles per unit train-hour in freight service is over 25,000. With a three unit locomotive, this gives 75,000 g.t.m. per train or locomotive hour. This is the actual average performance for the railroads considered. Not many years ago, 20,000 g.t.m. per train hour was considered a satisfactory operation.

TABLE 1—APPROXIMATE HORSEPOWER REQUIRED PER TON BY VARIOUS TRANSPORTATION INDUSTRIES

		Hp. per Ton
Highway:	Private automobile	50 to 100
	Bus	15 to 30
	Trucks	15 to 25
Railroad:	Passenger Main line	3 to 5
	Passenger Rail cars	5 to 8
	Freight high speed	1 to 1.5
	Freight slow speed	.5 to 1.0
Aviation		100 to 250
Marine, High seas		.25 to 1.0
Pipe Line		Fraction of

The normal horsepower ratios given are for the usual speeds encountered with the types of service indicated.

• Consulting Engineer

Abstract of a paper presented before the National Diesel Engine Meeting of the Society of Automotive Engineers

TABLE 2—CHARACTERISTICS OF MODERN GAS-TURBINE, DIESEL AND ELECTRIC LOCOMOTIVES

Type locomotive	Hp. Unit	Wheel Arrangement	Wt. ÷1000 lb. Per Axle	Wt. ÷1000 lb. Total	Cont. Rating TE lbs.	Cont. Rating Speed M.P.H.	Max. speed M.P.H.	Ratio Max. speed to cont. speed
Gas-Turbine	4,500[1]	B-B-B-B	68.8	550	105,000	12.9	65	5.0
Diesel	1,600[1]	B-B	62.5	250	52,500	9.3	65	7.0
	3,200	2(B-B)	62.5	500	105,000	9.3	65	7.0
	4,800	3(B-B)	62.5	750	157,500	9.3	65	7.0
	6,400	4(B-B)	62.5	1,000	210,000	9.3	65	7.0
Electric motors, Ac.	2,500[2]	B-B	60.0	240	35,400	26.5	65	2.1
Electric motors, Ac.	5,000	2(B-B)	60.0	480	70,800	26.5	65	2.1
Electric motors, Dc.	3,000[2]	B-B-B	62.50	375	66,000	17	63	3.7
Electric motors, Dc.	6,000	2(B-B-B)	62.50	750	132,000	17	63	3.7

[1] Locomotive hp. rating is input to traction generator.
[2] Electric locomotive hp. rating is at the driving wheels.
Tonnage Ratings are normally proportional to weight on drivers.

TABLE 3—FUEL AND POWER CONSUMPTION, 1952—CLASS I ROADS

	Unit Fuel Consumption: Switching Per Hr.	Inc. Locomotive and Tender Ft. per 1,000 G.T.M.	Passenger per car mile
Steam, Coal Lbs.	899	116	20.6
Steam, Oil, gals.	66.9	8.9	1.0
Diesel, Oil, gals.	7.1	1.6	.3
Electric, KW, hr.	113	27.8	3.7

Approximate total cost of transportation fuel and Power, 1952	$525,000,000.00
Approximate cost of fuel if all 1952 operations by:	
Steam Coal @ $5.5	$820,000,000.00
Oil @ 4.5	$936,000,000.00
Diesel Oil @ 9.8	$385,000,000.00
Electric @ 9.8	$ 16,000,000.00
Approximate cost of Power if all 1952 operations by: Electric @ 10.52 Mills	$642,000,000.00
Approximate cost of Total fuel if all 1952 operations by: Electric	$658,000,000.00

Analyzing further the horsepower capacities of diesel units, it will be noted that the units in freight service averaging 1,500 horsepower, account for nearly 56 per cent of all the units produced. This value is significant and indicates that locomotive multiples of 1,500 horsepower units, which give locomotives of 1,500 HP, 3,000 HP, 4,500 HP or 6,000 HP, best suit the general requirements of our American railroads.

The steam, electric and gas-turbine locomotives employed on our railroads, do not comply with these standards and in consequence would be limited in their general application.

Power Transmission

This important feature of our locomotive equipment is covered in some detail in the original paper. It will suffice to state here that some type of torque converter is required between the electric power transmission with an electric locomotive, and the power units of the diesel or gas-turbine locomotives.

The capacity and operating range of this torque converter controls the flexibility and operating possibilities of the locomotive unit as between heavy freight and high speed passenger service.

In this country, electric power transmission is standard for diesel locomotives and is also employed on the gas-turbine locomotives used in this country and in Europe. The simplest way to explain this question of transmission capacity and flexibility, is to consider modern diesel, gas-turbine and straight electric as locomotives applied in this country.

This transmission is heavy and were it not standardized and produced in quantity, it would be expensive. It is, however, ideal in its functioning and the weight can be profitably employed to obtain adhesion, tractive force and hauling capacity.

While this paper considers in some detail the rating and flexibility of electric transmission as applied to straight electric and self contained locomotives it is sufficient to state here that the horsepower developed in the locomotive may appear at the draw bar as large pull and low speed through large capacity motors, which is expensive or it may appear as small pull and high speed through relatively small capacity motors, which is relatively cheap.

This condition can be best followed by considering the most modern U.S.A. diesel, gas-turbine and electric locomotive characteristics as shown in Table 2 which shows the characteristics of the U.P. 4,500 horsepower gas turbine locomotive, the standard 1,600 horsepower or 1,500 horsepower diesel unit in various locomotive combinations and the straight a.c. motor and Ignitron electric locomotives recently delivered to the Pennsylvania.

It will be noted that all these freight locomotives employ combinations of two-axle, four-wheel trucks. The diesel and electric locomotives have a maximum axle load of 62,500 lb. whereas the gas turbine locomotive has an axle load of 68,800 lb.

The 4,500 hp. gas turbine locomotive has 50 per cent less driving axles and motors with 50 per cent less continuous tractive force of the corresponding 4,800 hp. diesel locomotive.

The 5,000 horsepower a.c. motor electric locomotive has 50 per cent less motors and only half the continuous tractive force of the corresponding 4,800 hp. diesel locomotive.

The 6,000 hp. Ignitron electric locomotive has one-third less driving axles and motors and over 50 per cent less continuous tractive force of the corresponding 6,400 hp. diesel locomotive.

The favorable comparison with the diesel locomotive is due to the practically 50 per cent greater transmission capacity with any given horsepower rating. This favorable diesel rating permits a 50 per cent heavier train on the ruling grade.

Fuel Consumption

One of the most important indices of motive power operating economy is its fuel or power consumption. Table 3 gives the unit fuel consumption values for the four principal sources of energy supplied to locomotives for the year 1952. The most significant comparison that may be made with the unit values is that between the residual oil fuel used with steam power and the distillate oil fuel used with diesel power.

From the values shown, it would appear that diesel power is now saving the railroads over $350,000,000 per year and with complete diesel operation, a saving of

approximately one-half billion dollars per year would be obtained. Contrary to the general popular impression, the diesel power saving over electric operation would be as great or greater than that of steam when the operation and maintenance of the electric contact system is taken into account.

Locomotive Requirements

The factors which should control the design and required performance of standard locomotives in Class I railroads may be briefly summarized as follows:

(a) The road locomotive should consist of units which can be readily assembled by the dispatcher to give horsepower outputs varying between 1,500 horsepower and over 6,000 horsepower.
(b) The axle loads and profile of the units should broadly comply with the permissible axle loads and clearances of practically all Class I railroads.
(c) The transmission capacity should be adequate to fully develop the locomotive horsepower rating over a large speed range to permit operation on level, rolling and grade profiles.
(d) The locomotive should preferably have a good fuel efficiency over its normal operating range.

The normal 4,500 hp. rating of the Union Pacific gas-turbine locomotive varies with the ambient temperature and atmospheric pressure. These variations may be easily followed on Table 6.

From the normal rating of 4,500 hp. for traction at 80 deg. F. and 1,000 ft. elevation, the horsepower of the locomotive varies 300 horsepower per 10 deg. F. air change and 100 horsepower change per 1,000 ft. altitude change. Between the extremes of 0 deg. F. and 120 deg. F. and 1,000 ft. and 6,000 ft. elevation, the output of the locomotive may vary between 6,000 horsepower and 3,300 horsepower.

Between Green River and Ogden, where the locomotives are mostly operated, a normal rating of 4,000 hp. for traction at 80 deg. F. and 6,000 ft. elevation is assumed.

Fig. 2, gives the characteristic operating range for the gas-turbine locomotive, the cross-hatched area showing the range of operation between the maximum output of approximately 6,000 hp. at 20 deg. F. and 6,000 ft. elevation and the output of 4,150 hp. at 100 deg. F. and 1,000 ft. elevation. This hatched area might be extended to include a 3,550 horsepower output at 120 deg F. and 1,000 ft. elevation.

For the purpose of comparison with other types of railroad motive power, Fig. 2 also includes curves showing the output for a three unit 4,800 horsepower diesel locomotive, a four unit 6,400 horsepower diesel locomotive and the 6,000 horsepower Ignitron locomotive. The weight and adhesion characteristics of all these locomotives are shown in Table 2 and were discussed when considering locomotive electric transmission.

For a complete understanding of the locomotive curve shown on Fig. 2, refer again to Table 2. The gas-turbine locomotive with eight driving axles and traction motors has a continuous tractive force of 105,000 lb. This tractive force may be delivered at a speed varying from 11.6 mph. to 16 mph., depending upon atmospheric conditions.

The 4,800 horsepower diesel locomotive with 12 traction motors and driving axles, has a continuous tractive effort of 157,500 lb. at a speed of 9.3 mph. which, as already mentioned, is 50 per cent greater than that of the gas-turbine locomotive.

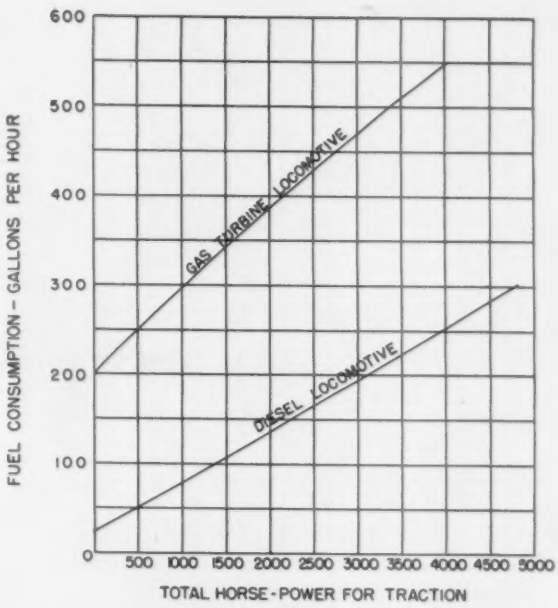


Fig. 1—Approximate fuel consumption for Union Pacific gas-turbine locomotive at 6,000 ft. elevation and 80-deg. air temperature compared with a three-unit diesel locomotive.

The 6,000 horsepower Ignitron electric locomotive with twelve traction motors and driving axles, has a continuous tractive force of 132,000 lb. The corresponding 6,400 hp. diesel locomotive has sixteen traction motors and a continuous tractive force at 18 per cent adhesion of 180,000 lb., which is 40 per cent greater than the electric locomotive.

We have already explained when discussing the electric transmission, the relation between the maximum and minimum permissible speeds and the corresponding flexibility of the various units. These values are given in Table 2.

Fuel Consumption

The next point of interest in connection with the gas-turbine locomotive, is its fuel consumption with various horsepower outputs. The 4,500 horsepower Union Pacific locomotive full load fuel consumption is stated to be between 550 to 600 gallons per hour of 18,600 Btu. per pound of fuel. At idling, the fuel consumption is stated to be approximately 200 gallons per hour. These values are in Fig. 1, which gives the fuel consumption of the locomotive unit with its normal traction output at 80 deg. F. and 6,000 ft. elevation.

For comparative purposes, the corresponding fuel consumption curve for a typical three unit diesel locomotive with a maximum output of 4,800 hp., is shown on Fig. 1.

With the rated output at 80 deg. F. and 6,000 ft. elevation of 4,000 hp. for traction, the gas-turbine fuel consumption per hour is 550 gallons and the diesel fuel consumption at 4,000 horsepower is 250 gallons per hour. The ratio of fuel consumption at this load is 2.2 to 1.0. While idling, the fuel ratio is 8.0 to 1.0.

The average fuel consumption rate is given as 335 gallons per hour for the gas-turbine locomotive. The cor-

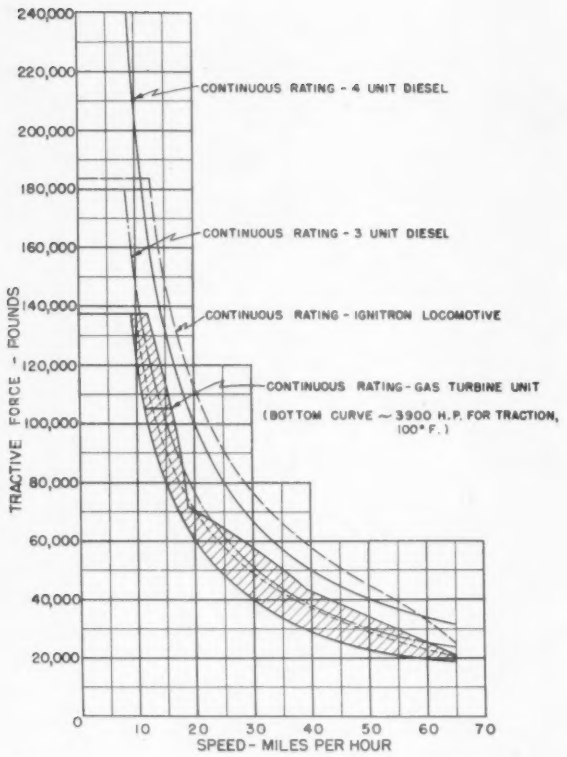


Fig. 2—Comparative tractive force-speed curves for electric, diesel-electric and gas-turbine locomotives.

responding diesel rate would be approximately 100 gallons per hour, which gives a fuel ratio of 3.35 to 1.0.

These values are significant and point to the fact that the gas-turbine locomotive on the Union Pacific would, under normal railroad conditions of operation, consume at least three times the fuel required with a diesel locomotive in comparable service.

However, since the U. P. operates the gas-turbine locomotive when hostling and during light and extended coasting periods with the turbines closed down and with auxiliary supplies from a small diesel motor-generator set, the actual fuel consumption on a 1,000 Gtm. basis as between the gas-turbine and the national diesel and oil steam locomotives are:

U. P. gas-turbine fuel consumption per 1,000 Gtm.—4.28 gal.

National diesel fuel consumption per 1,000 Gtm.—1.75 gal.

National oil steam fuel consumption per 1,000 Gtm.—10.2 gal.

We may therefore conclude that with carefully supervised operation, where advantage is taken of assigning maximum economic tonnage to the gas-turbine locomotive, with a minimum of idle turbine running the fuel consumption has been reduced approximately in the ratio of 3.35 to 2.4 or by approximately 25 per cent.

It is quite possible that the fuel consumption with the gas-turbine on a comparatively level or rolling profile, on a ton mile basis, will be found to be greater than on the heavy grade section where full load, with minimum turbine idling time, can be obtained.

The auxiliary boilers for passenger car train heating employed with electric, diesel and gas-turbine locomotives, generally employ distillate or diesel fuel with these boilers. Although this is not a requirement on the Union Pacific freight locomotive, it nevertheless represents over 30 per cent of the fuel consumption with diesel passenger locomotives during the winter months and averages throughout the year between 16 per cent and 17 per cent.

The operating record of the first six locomotives, according to latest reports, gives an average of 9,000 miles per month. The cumulative mileage to January 1953 was 437,771.

Locomotives 51 and 52 had an availability of 80 per cent and 82.4 per cent up to June 1953. No data of out-of-pocket operating expenses is available and it would appear that some time must elapse before a definite answer can be obtained of the operating costs of gas-turbine locomotives.

English Western Region Brown Boveri Unit

This unit of 2,500 horsepower known as No. 18,000 was completed at the end of 1949 and as previously stated is a development of the 2,200 hp. Swiss unit built in 1941.

It was delivered in England early in 1950 and considerable information regarding its construction, performance and initial troubles have been published in the technical press and lately in a paper by A. W. J. Dymond in February 1953 at the Institute of Locomotive Engineers in England.

As shown in Table 4, the gas-turbine works at a maximum temperature of 1,100 deg. F. with a pressure ratio of 3. The unit burns residual fuel with a viscosity of 950 secs., Redwood No. 1 at 100 deg. F. and a net calorific value of 17,400 Btu. per lb. For starting purposes, gas oil is employed. A Saurer diesel engine of 150 hp. drives a 40 kw. generator for lighting and auxiliary supplies. A train heating boiler of 1,000 lb. per hour rating for car heating is employed. This unit was given the usual shake-down operation before being placed in revenue passenger service in the middle of May 1950.

During its first year's operation, the initial difficulties were those that might be expected with any new unit. After about eighteen months, information was acquired regarding maintenance technique, with particular reference to the necessity of cleaning blading and intercooler tubes at frequent intervals.

Traction motor trouble and a heat exchanger fire, reduced the service availability of the unit during its first two years of operation.

From its arrival in England early in January 1950 to early February 1952, or approximately for a period of two years, the unit completed 72,590 miles with a turbine operation of 1,913 hours.

Due to certain blading defects, the unit was withdrawn from service in September 1952 and the opportunity was then taken to overhaul the unit and install a new boiler. Up to September 6, 1952 or for a period of about two and one-half years, the unit completed 117,789 miles and the turbine operated 3,296 hours with an availability factor of 63.9 per cent.

This unit was confined in revenue service to the haulage of high speed passenger trains with relatively few stops. Diesel Railway Traction in its issue of July 1952, published a table reproduced as Table 5, which gives a test record of unit No. 18,000. The same article brings out the fact that although the thermal efficiency at full load and 1,100 deg. F. was 16.9 per cent with a fuel con-

TABLE 4—GAS TURBINE LOCOMOTIVES IN SERVICE

1. Railroad	Swiss Fed. Rys.	Western Region	Western Region	Demonstrator	Demonstrator	Union Pacific
2. Turbine builder	Brown Boveri	Brown Boveri	Metronolitan Vickers	Westinghouse Electric	General Electric	General Elec.
3. Locomotive builder	Swiss Locomotive Works	Swiss Locomotive Works	Metronolitan Vickers	Westinghouse Electric	General Electric	General Elec.
4. Electrical builder	Brown Boveri	Brown Boveri	Metropolitan Vickers	Westinghouse Electric	General Electric	General Elec.
5. Rated HP. Locomotive	2,200	2,500	3,000	4,000	4,500	4,500
6. No. Turbines	1	1	1	2	1	1
7. No. generators per Turbine	1	1	3	2	4	4
8. No. combustors per Turbine	1	1	6	12	8	6
9. No. stages per Turbine	6	7	5	8	2	2
10. Rpm. of Turbine unit	5,200	5,300	7,000	8,750	6,900	6,900
11. Type regenerator	Cross flow	Cross flow	——	——	——	——
12. Top cycle temp. degrees F.	1,110	1,100	1,300	1,350	1,200	1,290
13. Percent efficiency full load	16	15.8	18	16.9	16	16
14. Wheel arrangement	1A-B-A1	A1A-A1A	C-C	B-B-B-B	B/B-B/B	B/B-B/B
15. Total weight, lb., Max.	203,000	266,890	290,000	494,000	530,000	550,000
16. Weight on drivers, lb.	142,000	177,920	290,000	494,000	530,000	550,000
17. Length Over All, ft.-in.	53—10	63— 0	66—9¼	77—10	83— 8	83— 6½
18. Wheel Base, Total, ft.-in.	41—10	50— 1	53— 0	62— 9	68— 3	68— 1
19. Wheel Base, Rigid, ft.-in.	11— 1	11—10	15— 0	9— 0	9— 4	9— 4
20. Width, ft.-in.	9— 6	9— 3	9— 0	10— 2½	10— 7	10— 7
21. Height, ft.-in.	13—11	13— 4	12—10	15— 0	15— 4	15— 5
22. Continuous tractive force, Lb.	14,000	12,400	30,000	52,800	77,800	105,000
23. Mph. at Continuous tractive force	47.5	64.	30	23	18.2	12.9
24. Maximum mph.	70	90	90	100	69.3	65
25. Railroad	Swiss Fed. Rys.	Western Region	Western Region	P.R.R.-M.K.T.-C. & N W	P.R.R.-Nickel Plate-U.P.	Union Pacific
26. Date order placed	March, 1939	October, 1946	July, 1947	Demonstrator	Demonstrator	Decembar, 1950
27. Date first operated	August, 1941	October, 1949	February, 1952	1949	November 14, 1948	See Table II
28. Number of locomotives	One	One	One	One	One	Ten

TABLE 5—TEST OF WESTERN REGION GAS-TURBINE LOCOMOTIVE No. 18000

Trains—South 3.30 p.m. Express Paddington to Plymouth. Dropping one coach at Heywood Railroad Junction stopping at Taunton & Exeter.
North 7.15 a.m. Express Plymouth to Paddington. Stopping at Totnes, Newton Abbot, Teignmouth, Dawlish, Exeter, Taunton and Westbury.

	1	3	2	4
Run number	11.9.51	13.9.51	12.9.51	14.9.51
Date	South	South	North	North
Direction	119.2	119.2	119.2	119.2
Weight of locomotive, tons				
Wt. and No. of cars				
Paddington-Westbury, tons	395 for 12	395 for 12	——	——
Westbury-Exeter	359 for 11	359 for 11	——	——
Exeter-Plymouth N. Rd.	239 for 7	239 for 7	——	——
Plymouth N. Rd.-Newton Abbot	——	——	228 for 7	227 for 7
Newton Abbot-Exeter	——	——	388 for 12	356 for 11
Exeter-Paddington	——	——	388 for 12	386 for 12
Distance, miles	225.2	225.2	225.2	153.2
Distance under power, miles	182.2	189.4	185.6	120.2
Ton miles—excluding loco.	78,000	78,000	82,400	53,600
Time, min	259.0	259.0	275.0	——
Time, Actual	252.3	251.4	269.0	186.1
Time, Overall (including stops)	265.5	264.4	296.3	220.0
Time, Actual less drifting and idling (under Power)	209.9	204.0	213.4	175.6
Average speed, mph.	53.6	53.7	50.2	49.4
Work done, drawbar hp-hr.	2,520	2,824	2,621	2,135
Average drawbar hp.	721	831	736	729
Average drawbar pull, tons	2.25	2.59	2.46	2.47
Oil used: Heavy, lb.	4,960	5,230	5,450	4,340
Light, lb.	224	223	250	186
Total, lb.	5,184	5,453	5,700	4,526
Lb. per db. hp-hour	2.05	1.93	2.17	2.12
Oil—Total used under power: Heavy, lb.	4,496	4,727	4,759	3,970
Light, lb.	177	172	180	148
Total, lb.	4,673	4,899	4,939	4,118

	Overall total	Under power	Overall total	Under power	Overall total	Under power	Overall total	Under power
Oil rate—Heavy, lb. per hr.	1,121	1,282	1,210	1,350	1,102	1,337	1,181	1,353
Light, lb. per hr.	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Total, lb. per hr.	1,176.6	1,332.6	1,260.6	1,400.6	1,152.6	1,387.6	1,231.6	1,403.6
Oil rate, drifting and standby, total lb.	550.6		550.6		550.6		550.6	
Gross calorific value of oil—Heavy, Btu. per lb.	18,530		18,580		18,680		18,740	
Light, Btu. per lb.	19,610		19,590		19,530		19,490	
Oil per mils, lb.	23.02		23.20		24.2		28.3	

sumption of .87 lb. per horsepower hour, at half load the temperature was only 650 deg. F. and the average thermal efficiency at the drawbar on the test runs never exceeded 8 per cent.

As an example of the effect of load on the efficiency of the gas-turbine locomotive, the same article points out that with trailing loads of 200 tons, 300 tons and 400 tons, which could be hauled on level track at 80 mph., the respective fuel consumptions were 0.09 lb., 0.075 lb., and 0.065 lb. per ton mile, corresponding to 1.95 lb., 1.6 lb., and 1.4 lb. per draw-bar horsepower. These values indicate that with this particular unit, with a reduction in

(Continued on page 61)

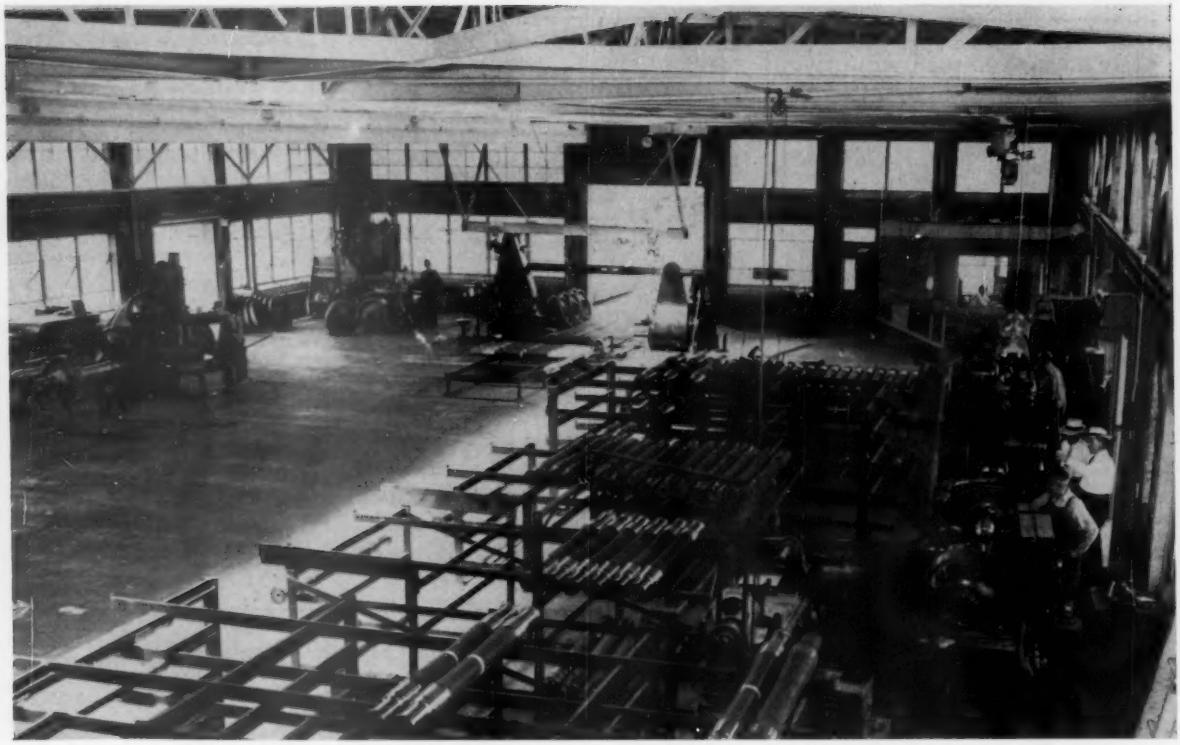
TABLE 6—RATING TABLE—UNION PACIFIC GAS-TURBINE LOCOMOTIVES

Hp. for Traction	Hp. of Turbine	Air Temperature-deg. F.	Altitude-feet
3,300	3,550	120	1,000
3,400	3,650	100	6,000
3,900	4,150	100	1,000
4,000	4,250	80	6,000
4,500	4,750	80	1,000
			(Standard rating)

Note: See Fig. 2 for locomotive output as the generators can not utilize the full output of turbine as shown in following ratings:

4,600	4,850	60	6,000
5,200	5,450	40	6,000
5,800	6,050	20	6,000
6,400	6,650	0	6,000

Note: Above based on 300 Hp. Change for 10 deg.F air change: 100 Hp. Change for 1,000-ft. altitude change.

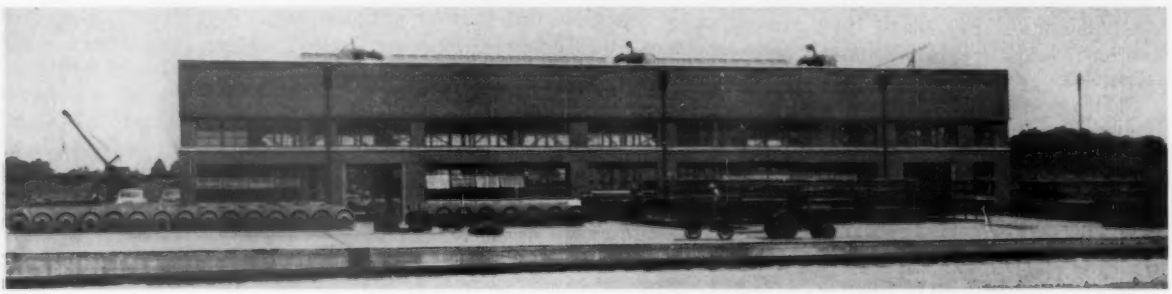


How the Frisco

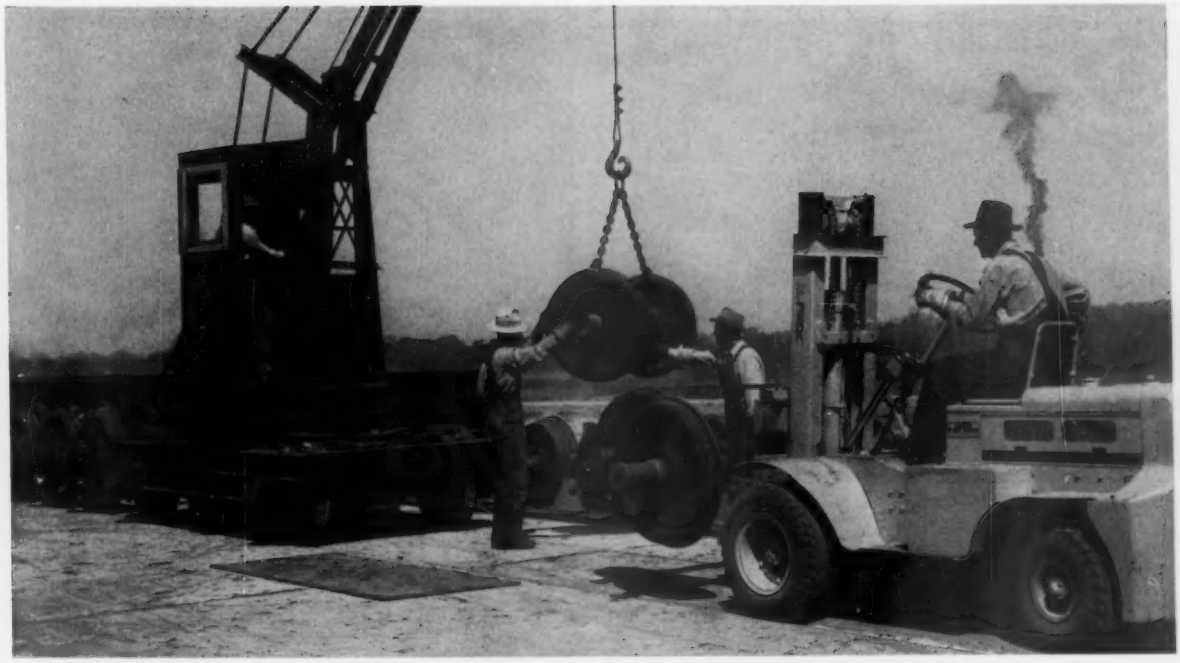
Used wheel sets are brought into the shop through this brick and glass-enclosed section.

ABOUT 18 months ago the Frisco moved into a new and modern wheel shop at Springfield, Mo., which consolidates at one location the wheel mounting and part of the journal turning of mounted second-hand wheel sets for the entire system which was formerly done at five scattered points. The new facilities are located in a building 70 ft. by 140 ft. bordered on all four sides by a 100-ft. concrete platform.

In laying out and setting up the new wheel shop, the Frisco made a number of modifications to existing machinery to improve the quality of the work and to increase the output. Careful study was likewise given to the layout of the shop for efficient material flow, with most of the material handling done by fork truck.



Outdoor storage capacity is 1,200 axles in four racks, and 865 secondhand and 1,285 new or repaired wheel sets.



A 4,250-lb. air-operated crane on the platform unloads used wheels from depressed track.

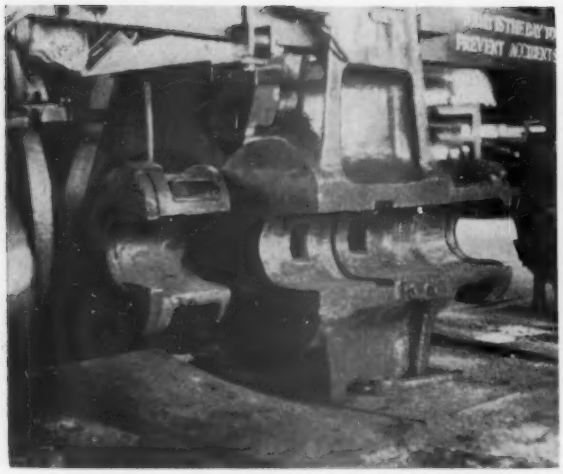
Modernized Wheel Shop Practice

Used mounted wheel sets are rolled into the shop to the demounting press on the east end. The scrap wheels are disposed of along the east end of the building by wheel carriers, and the axles are placed on a conveyor consisting of a dolly running on a narrow gage track. The conveyor carries the axles out of the building through an opening in the wall to the classification rack by the southeast corner of the building where the axles are sorted as OK or scrap, and according to size and one of six $\frac{3}{64}$-in. step sizes within each size. From the classification rack the axles are moved five at a time by fork lift truck to the scrap racks or the storage racks along the south wall.

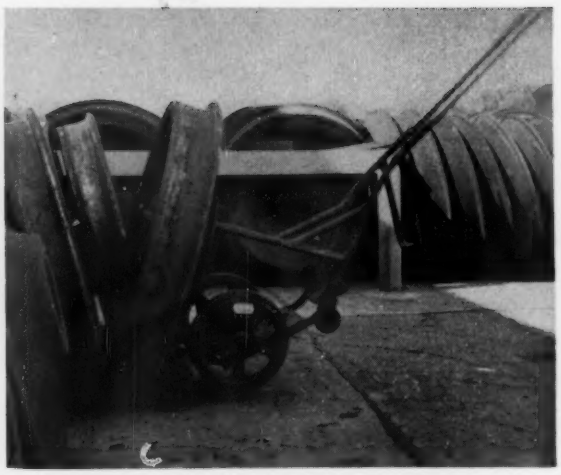
The OK axles on the storage racks, after being classified for size and step size, are placed again by fork trucks on a cleaning machine rack on which the axles flow by gravity through a cleaning machine and on into the shop. A small rack just inside the building holds five axles for pickup by fork truck, which delivers them to the storage racks by the Sellers lathes. The top tier of this rack holds up to 25 axles of one size and is filled each morning. The lathe handles from 17 to 20 axles a day depending on size. As the machine completes each axle, it automatically discharges that axle to the middle tier, which also has a capacity of 25 axles. When that tier becomes filled, the group of axles on it can be placed by fork truck on the bottom tier for storage.

When called for, the axles are delivered to the Magnaflux machine rack for inspection. This rack has an arrangement and procedure similar to that just described. After inspection the axles are moved by fork truck to the mounting racks near the west end where the wheels are mounted and the wheel set rolled out to storage on the west side of the building.

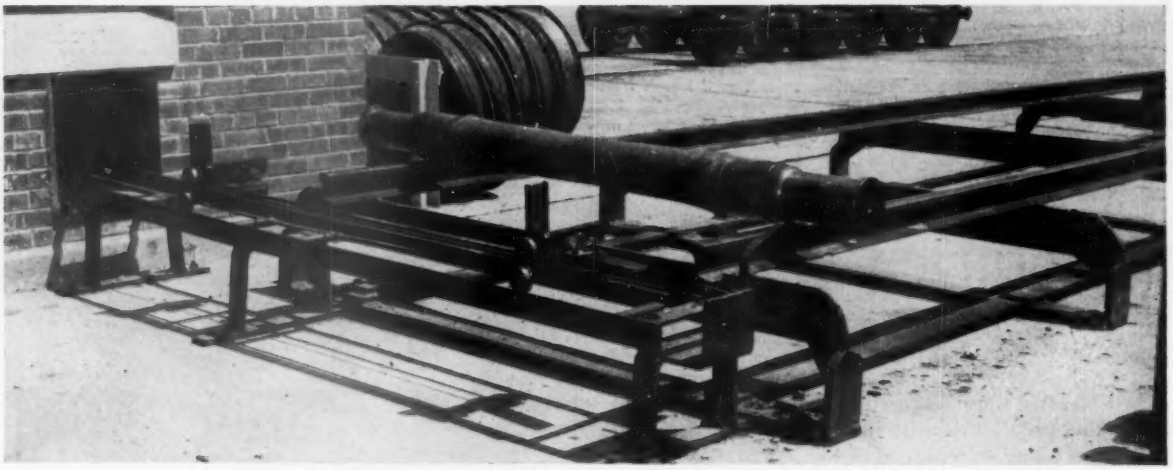
The stripping press, made from two old single presses, removes both wheels without turning the axle.



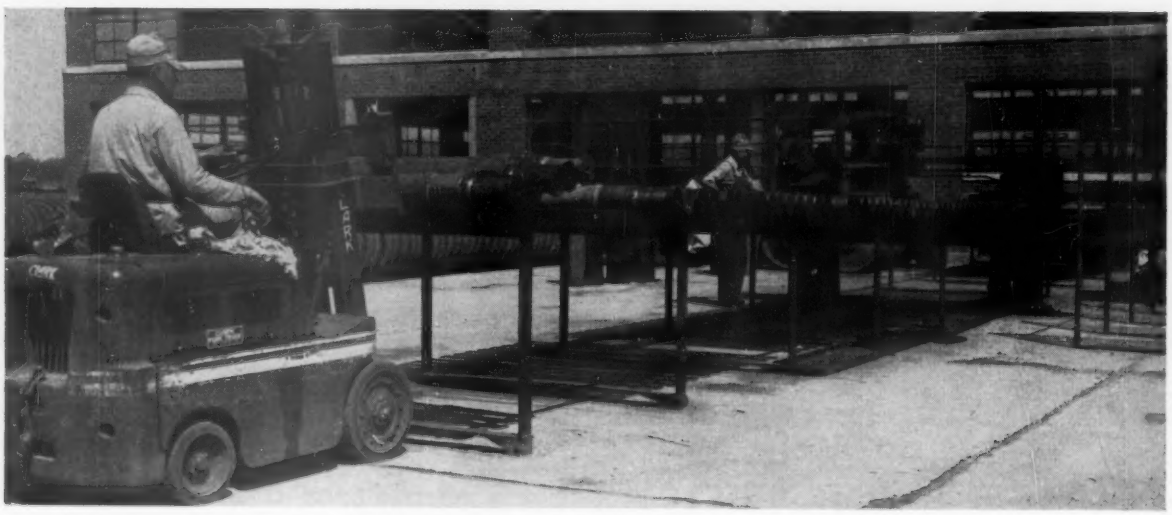
Spacer blocks between the ram and the yoke permit pushing axle through the wheel on each end in succession.



This, carrier with an extra pair of front wheels, facilitates unloading scrap wheels.



Dolly discharges axles to the classification rack and automatically returns for another load.



Axles lifted by fork truck roll by gravity into the shop for cleaning.

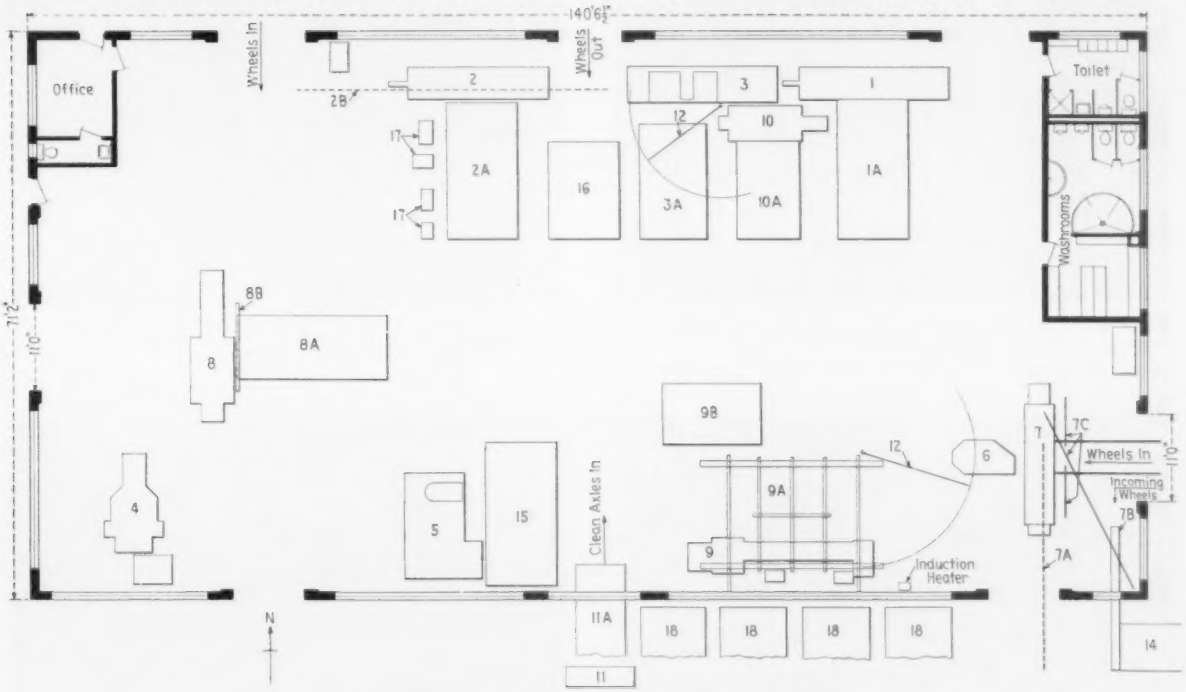
MACHINERY AND PERSONNEL ASSIGNMENTS AT THE SPRINGFIELD WHEEL SHOP

Machine	Manufacturer	Motor Hp.	Uses	Shifts operated	Personnel per shift
End drive axle lathe	Sellers	2-10	Turn and burnish journals and turn wheel seats	1	1 machinist
End drive axle lathe	Sellers	2-10	Turn and burnish journals on mounted wheel sets	1	1 machinist
Center drive axle lathe	Betts-Bridgeford	40	Turn and burnish journals and turn wheel seats	1	1 machinist
Boring mill	Niles	40	Bore car wheels	1	1 machinist
Boring mill	Niles	15	Bore freight and passenger steel wheels	1	1 mach. apprentice
Boring mill	Niles	30	Bore diesel wheels	1	1 machinist
Dismount press	Niles	2-10	Dismount passenger wheels	part time	3 mach. helpers†
Mounting press	Niles	10	Mount freight and pass. car wheels	part time	
Magnaflux and Magnaglo	Shop made	Air motor	Rotates axles for inspection	part time	1 machinist*
Axle cleaner	Shop made	1½ and 3	Clean all axles by wire brushes	part time	
Diesel wheel press	Chambersburg	15	Mount and dismount all diesel wheels	part time	1 mach. helper#
					1 machinist*
Fork truck	Clark	4,000 lb.	Move loose wheels and axles and mounted wheel	1	1 operator
			Clean up shop and other laborer duties	1	1 laborer
			Total mechanical department employees		13
			Total store employees to load and unload all loose axles and wheels and mounted new, second hand and scrap wheels		5

*Same man—divides his time between these two jobs.
#Also operates axle cleaner.
†One of the helpers from press helps Magnaflux, pulls sleeves, cleans diesel gears and axles also car axles and applies protective coating to turned journals for shipment.

DATA ON MACHINE OPERATIONS

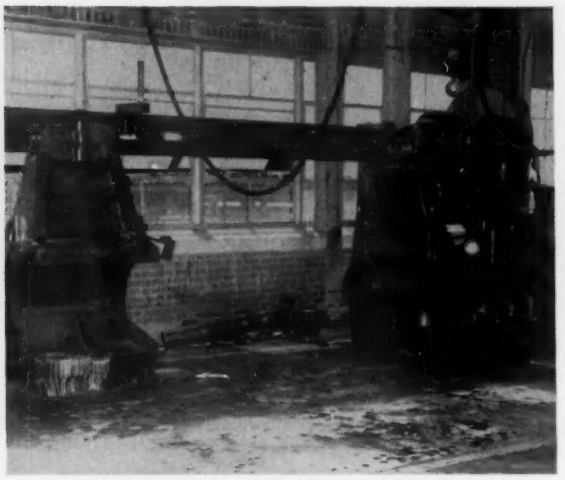
Operation	Machine	Type tool	Machine speed R.p.m.	Feed In./Rev.	Average output 8 hr.	Floor-to-floor Time
Turn and burnish freight car axles	Sellers	Carbide	100-200	.025	19	25 min.
Turn and burnish freight car axles	Betts-Bridgeford	Carbide	100	.030	14	34 min.
Bore chilled wheels	Niles-Hydraulic	High speed			88	5½ min.
Rough cut		High speed	31	.010		
Finish cut		High speed	31	.020		
Bore steel wheels	Niles	High speed			28	17 min.
Rough cut		High speed	20	.010		
Finish cut		High speed	26	.020		
Bore and face diesel wheels	Niles				4	2 hr.
Rough cut		Carbide	60	.033		
Finish cut		Carbide	46	.033		
Turn wheel set treads	Sellers 52 in.	High speed	2	.250	8	1 hr.
Turn freight car wheel set journals	Sellers	Carbide	100-200	.025	24	20 min.



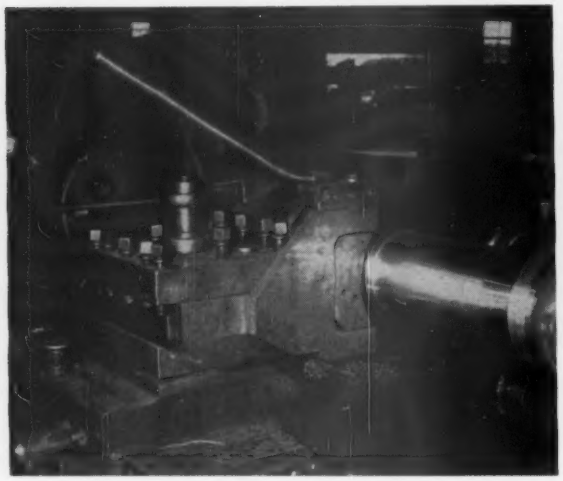
Arrangement and location of wheel shop equipment

1. Sellers end-drive axle lathe
1A. Rack for above (3 tiers, 72 axles)
2. Sellers end-drive axle lathe
2A. Rack for above (3 tiers, 72 axles)
2B. 4,000-lb. monorail crane
3. Betts-Bridgeford center-drive axle lathe
3A. Rack for above (3 tiers, 75 axles)
4. Niles boring mill (Freight car wheels)
5. Niles boring mill (Passenger-car wheels)
6. Niles boring mill (Diesel wheels)
7. Niles double-end dismounting press
7A. Monorail serving stripping press
7B. Automatic axle conveyor
7C. Monorail hoists
8. Niles mounting press
8A. Mounting rack (30 axles)
8B. Monorail (2½-ton electric hoists)
9. Chambersburg 600-ton diesel wheel press
9A. Travelling crane (2 hoists, 6,000 lb. each)
9B. Diesel rack (8 axles with gears)
10. Magnaglo axle inspection unit
10A. Inspection rack (3 tiers, top inbound, center outbound, bottom storage)
11. Axle cleaning machine
11A. Cleaning rack (45 dirty axles, 45 clean axles)
12. 2,000-lb. post crane
13. 4,000-lb. post crane
14. Receiving rack for unmounted axles
15. Five-tiers, 150-axle rack
16. Five-tier, 85-axle rack
17. Tool grinders
18. 325-axle outdoor racks

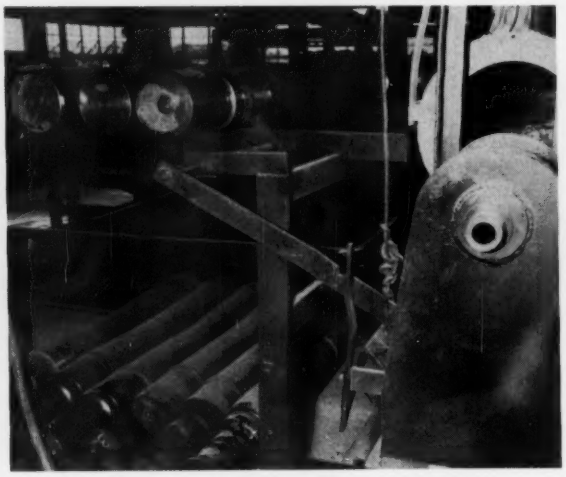
Passage through the cleaning machine and on into the shop is completely automatic.



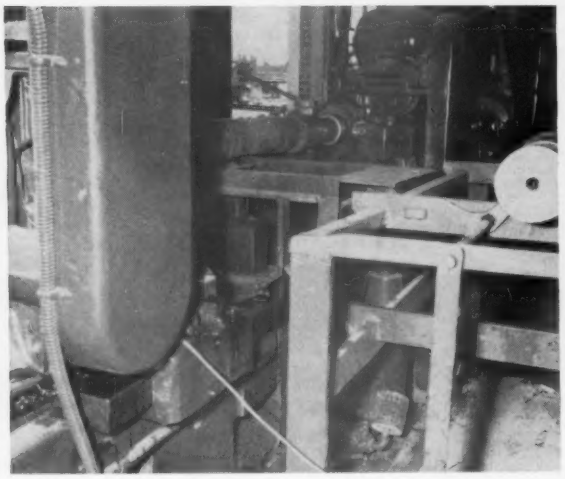
Diesel wheels are mounted and dismounted on rebuilt press with the aid of portable ram attachment at rear.



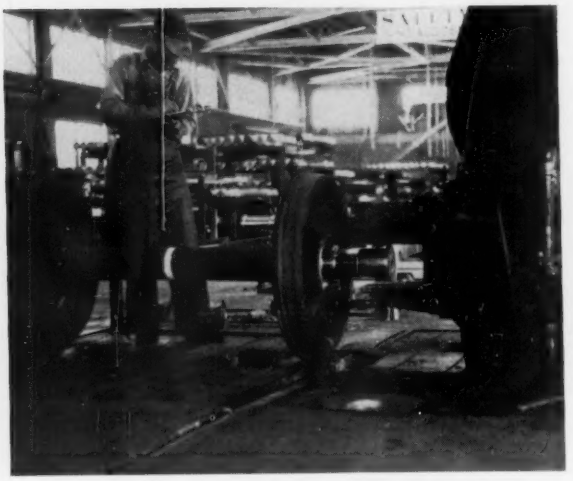
Swivel tool holders with narrow tools are used on all lathes, used for turning axles.



The trip, released by the operator from his regular station, feeds one axle at a time to the lathe.



The air jack and the hydraulic jack for loading and unloading the Sellers lathe.



With the pivoted spacer blocks on the mounting press, both wheels can be pressed on without turning the axle.

New freight car wheels are stored on the south, west and north sides of the building. They are moved into the shop by fork truck five at a time to the Niles hydraulic boring mill in the southwest corner. After boring, the wheels are placed along both sides of the mounting rack just north of the mill. Solid bearing passenger car wheels and axles are handled in the same manner as the freight car wheels.

On roller bearing passenger-car and diesel-locomotive wheel sets, journal and tread turning are done in diesel shop; finishing new axles is done in the former steam backshop at Springfield which is close by the wheel shop. The wheel work and handling is quite similar to freight car wheel operation except that passenger car wheels are bored on the center mill, diesel wheels on the one near the east end of the shop. Diesel wheels are mounted and demounted on the Chambersburg 600-ton press along the south wall, passenger wheels on the freight car wheel presses.

Modernization of Machinery

Some of the machinery in the wheel shop was purchased new while other machinery was modified for the new shop. Of the three axle lathes, two are the new Seller's end-drive with electronic control. Lacking a center drive mechanism, these lathes can be loaded and unloaded directly and automatically from the supply rack. Either lathe can complete 11 new axles per shift taking both roughing and finish cuts on the journal and wheel seats, or 22 second-hand axles.

One lathe is used to turn journals on mounted wheels, in which case it has a production of about 24 sets per shift. The mounted wheel sets are handled on and off the lathe by an overhead monorail with a 2-ton electric hoist. The monorail extends beyond the lathe to two doorways on either side. Journals are turned on about 250 wheel sets per month; when no mounted wheels are being turned on this lathe, it is used for turning axles.

The axles to be turned in this lathe roll by gravity until the one nearest the machine comes against a pivoted stop. Pulling a rope at the operator's station releases the stop to permit one axle to roll from the rack across an air-jack platform onto a pair of rails mounted on the lathe. The axle is raised to the level of the machine centers by a hand-operated hydraulic jack.

When machining is completed, the axle is lowered by this jack to the rails and rolled onto the air-jack platform. Lowering to the center tier of the rack is done by a valve which releases the air from the jack cylinder.

The third axle lathe is a Betts-Bridgeford center drive lathe which can handle about nine new axles per shift or 16 second-hand axles. It is loaded with the aid of a 1-ton, 7-ft. jib crane which helps guide the axle through the center drive mechanism. Originally this machine had the wide carbide tool normally sold with it. In modernizing the lathe a radius turning tool with a narrow cutting edge was substituted for the wide tool. The new tool has a $\frac{1}{8}$-in. radius for turning the fillets at the collar. A swivel tool holder was substituted for the original tool post for turning the $\frac{3}{4}$-in. radius at the dust guard. The tool changeover gives several advantages—it has eliminated breakage of the drive jaws, produces better work because of elimination of chatter, the smaller cutting surface is easier on the machine, inventory of tools is reduced because the new tool is identical with that used on the Sellers lathes and the tool itself is cheaper.

Another modification made to the machine was a change in the gearing to give the finer feed necessitated by the use of the narrower tool. The feed was cut in half from .036 in. to .018 in., while the cutting speed was left unchanged.

A different gear case was made to fit over the different diameter gears. The new casing has a split housing to permit getting at the gearing without removing the motor sheave. It is no longer necessary to disturb anything to tear the gears down should this become necessary.

Cleaning Operation Automatic

Another new machine cleans all types of axles. The axles roll by gravity down the cleaning machine rack onto the machine, are cleaned, and unloaded from the machine to a continuation of the cleaner rack which leads into the building through an opening in the wall. The above operations are all completely automatic. When a run of axles is to be made, the desired number of that size (e.g., $5\frac{1}{2}$ by 10, No. 3) are placed on the cleaner rack, and they end up inside the shop and clean without intermediate handling.

The machine cleans with four wire brushes $\frac{3}{4}$ in. by 7 in. in two pairs, with the two brushes in each pair placed with the stiffeners back to back.

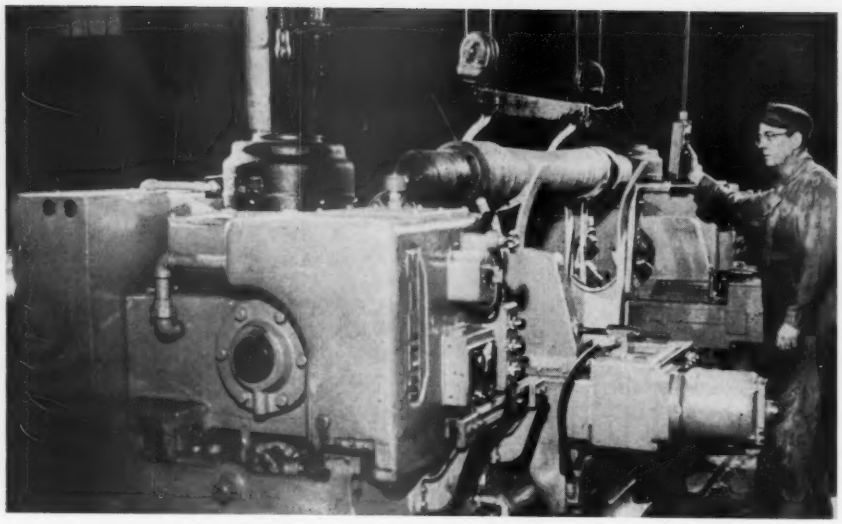
Brush life averages from 150 to 200 axles per set of four brushes when two passes are made over each axle. The brushes are mounted on a weighted and pivoted arm that permits them to follow any irregularities in the axle contour.

Once the cleaning machine is started the axles continue to feed through without further attention, cleaning about one axle per minute. The cleaning arm at the completion of its stroke trips a valve that operates an air cylinder which in turn moves a shaft with two arms that lifts the cleaned axle up and over the roller mounting onto the discharge rack into the shop building. A second release feeds another axle into the machine.

Modifications to Wheel Presses

The three wheel presses used in the shop are from previous Frisco wheel shops, but all three have been modernized to include features not incorporated in the original design. The stripping press was built up from parts from two single presses. Three one-ton electric hoists handle the lifting operations at this press. The mounting press was also modified to eliminate lifting and turning between operations on opposite wheels. The diesel wheel press was rebuilt from what was originally a 600-ton steam locomotive wheel press with the base recessed in the floor to line up the ram with the wheels. On this press, it was necessary to turn the axle to mount or demount the wheels, but the center yoke does not need to be moved for either operation.

In mounting, a filler piece fits in a slot in the yoke and a clamp over the flange holds the wheel upright. The axle, supported by a crane, is pushed into the wheel and the operation is repeated for the second wheel. In dismounting, one wheel is placed against the yoke with the journal toward the ram. A portable ram extension is used to press the axle through the wheel: the axle is turned and the procedure repeated.



The rough axle is being loaded mechanically into a Niles double-end centering machine for recentering.

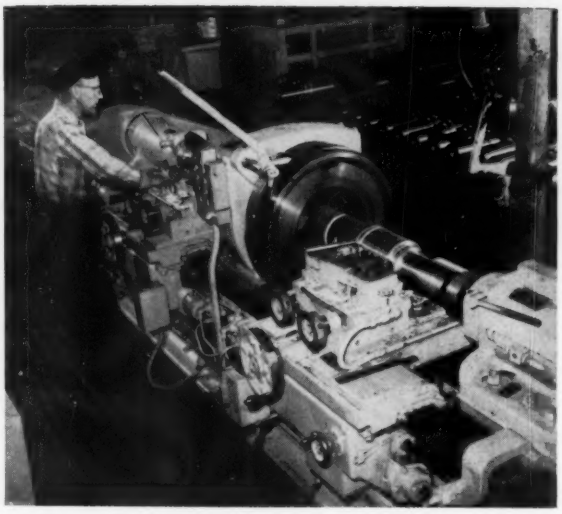
How Roller Bearings Are Applied To Freight Cars

A production line for machining axles and fitting bearings on new cars has been developed by the American Car & Foundry Co. and is operating at its Huntington, W. Va., plant

AFTER a development program extending over a period of five years the application of roller bearings to freight cars on a production basis is under way at the Huntington, W. Va., plant of the American Car & Foundry Co. This involves machining axles and wheels and the application of bearings and journal boxes to the axles.

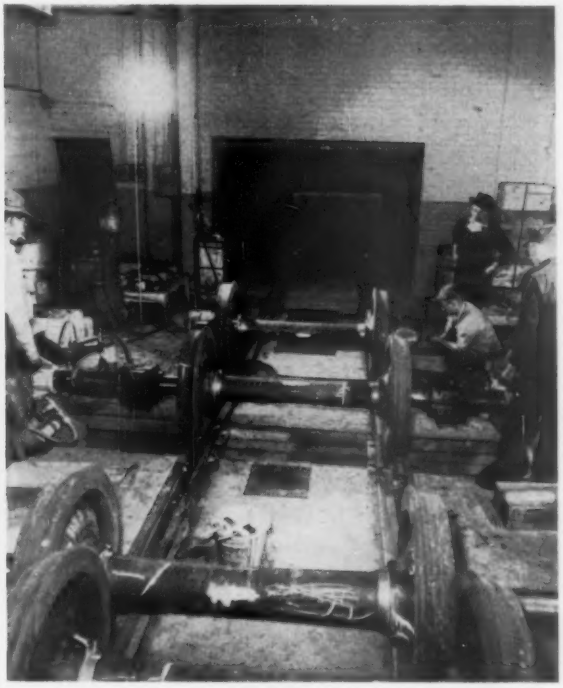
The major facility devoted to this work is the wheel and axle machine shop. This is equipped with special machines, each machine and its tooling being adapted to perform one operation. The operatons are (1) recentering; (2) rough-turning the journal, dust-guard collar and wheel seat; (3) finish turning the wheel seat; (4) drilling, countersinking and tapping the holes in the end of the axle by which the end caps are secured; (5) finish turning the journals and dust-guard collars; (6) grinding the journals and dust-guard collars, and (7) cold-rolling the journals. All work is performed to close tolerances.

Steel wheels are bored on four car-wheel boring machines with one operator for two machines. Carbide roughing cutters and tool-steel finishing cutters on the same bar complete each wheel at one setting. The table



After rough turning the journal and wheel seat on a Betts center-drive axle lathe, both wheel seats are finished at one time in this machine—another Betts center-drive lathe.

Journals and dust-guard seats are finished turned on this Monarch dual-carriage lathe (left), using an air-gage tracer. This step follows drilling, countersinking and tapping the ends of the axle for the roller-bearing cap on a Baker Bros. automatic two-way machine. Right: With the aid of special journal-box protectors, wheels are mounted on the completed axle ready for the press after the journals have been ground in a Cincinnati centerless grinder and rolled on a Betts burnishing machine.



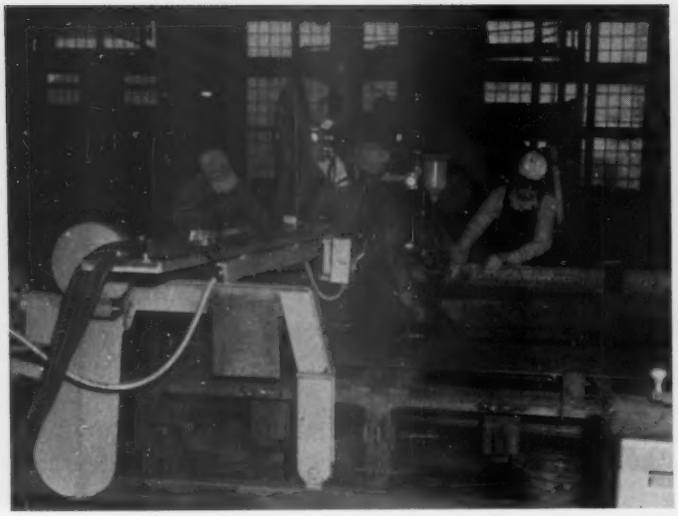
After journal boxes are cleaned, the boxes and bearings are assembled on line (left) ready for pressing on the axles. At the right, assembled Timken journal boxes are being pressed on the axles, caps and box covers applied, and the boxes filled with 4½ lb. of grease. The assembly line for journal bearings and boxes adjoins this space at the left.

speed is automatically reduced as the finishing cutter feeds into the work.

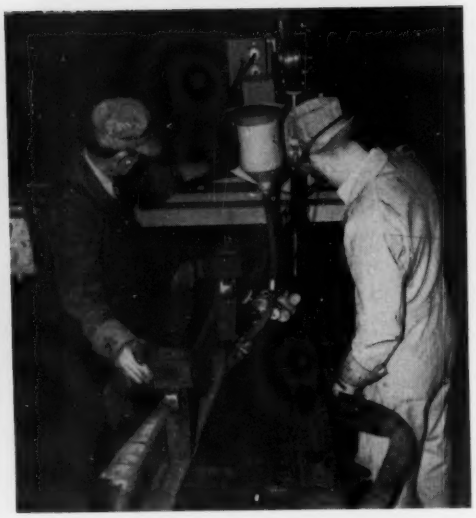
Wheel seats on the axles and the wheel bores are finished to a tolerance of 0.001 in. Wheels and axles are then matched in two groups, the diameter variations of each of which are within 0.0005 in.

The axles are moved between machines by monorail and self-feeding racks. From the cold-rolling machine the monorail moves the axles to one end of the rack which supplies the wheel press. Here the axles are inspected and fed to the wheel press. Wheels are rolled from the boring mills to the mounting position where they are started onto the axle mechanically and then rolled to the press. From the press they roll into the end of the roller-bearing assembly line. Here the bearings, assembled in the boxes, are pressed on the axles, end caps applied, and boxes filled with grease. The mounted wheels are then ready for truck assembly line.

The car-building plant is now daily turning out 20 covered hopper cars with Timken roller bearings on an order for the Atlantic Coast Line. The wheel and axle plant has a capacity up to 100 axles per eight-hour day.



Starting A-frame (left) on its way to welding floor angles to a web plate in fabrication of fish-belly side sills. The guide wheel (right) automatically adjusting direction to follow the changing contour of a fish-belly side sill.



Floor angles (left) are welded to the opposite side of the side sill simply by changing the angle of the welding head. Welds joining the top and bottom angles (right) are clean and smooth, requiring no finishing.

Layout for Welding Fish-Belly Underframe Parts

The C&EI and the Oxweld Railroad Service Company have jointly developed an arrangement for welding angle irons to web plates in fabricating the two side and two center sills of a 70-ton fish-belly flat car by the submerged melt process. Since the bottom contour of the sills changes direction four times, a mechanized welding unit that could move longitudinally and diagonally at the same time was designed. The machine is used at the road's Danville shop.

A Unionmelt DS welding head is installed on a specially designed mechanized A-frame carriage, 4 ft. high, which straddles the work in gantry fashion and rides on two 60-ft. long rails. Two other rails upon which the Unionmelt DS-37 machine travels are mounted atop and crosswise to the A-frame. The A-frame is equipped with a 1-hp., 1,750 r.p.m., d.c. motor and a series of rheostats which furnish variable longitudinal speeds of 20 in. per min. to 48 in. per min. Shaft connections to a drive wheel on both sides of the gantry propel it along the main rails. A clutch permits disengagement for manual pushing of the carriage.

Fabrication of the side sill is begun by welding a 6 by 4 by $\frac{3}{4}$-in. angle iron to the top length of a 52-ft. long, $\frac{3}{8}$-in. thick web plate. This will be the inside floor angle of the side sill. After the angle is clamped and tack-welded into position, the A-frame is moved directly over the assembly. The Type DS-37 carriage riding crosswise on the frame is locked in place and the welding head cocked at a 45-deg. angle. This $\frac{5}{16}$-in. fillet weld is perfectly straight, so only the A-frame is set in motion longitudinally. Welding speed for this operation is 24 in. per min. at 780 amp. d.c. reverse polarity. The

welding rod used is Oxweld Type No. 36, $\frac{3}{16}$ in. with a 90-grade melt. Web plate and angle are open hearth mild steel.

It is in the next operation that the A-frame best proves its versatility. Five lengths of angle iron are clamped, then tack-welded to the bottom of the web plate, following the fish-belly contour. The welding head guide wheel is set to "toe-in" about $\frac{1}{4}$ in. to follow the contour of the angle irons. As the weld angle changes, the guide wheel automatically adjusts the direction of welding without loss in welding speed.

Following this operation, the web plate is flopped over to expose the other unwelded surface. Since it is now resting on the 4-in. high angle irons welded earlier, the head is raised to this new level by means of a telescopic tubing. Seventeen sections of 6 by 4 by $\frac{1}{2}$-in. floor angles are clamped into place, about 5 in. apart, along the top length of the web plate, backing up the already welded inside floor angles. These will be the outside floor angles of the side sill. Spacer plates are placed between the separated floor angles permitting uninterrupted welding. This $\frac{1}{4}$-in. fillet weld is made at a speed of 30 in. per min., using the same materials as in the preceding operations. Approximately 154 ft. of welding is required for each side sill.

Construction of the two center sills requires only a slight variation in the welding steps. Each center sill has two sets of directly opposing angle irons following the contour of the fish-belly bottom, one on either side of the web plate. This, of course, necessitates two contour-welding operations whereas only one was required on the side sills. A single floor angle is welded to the top of the center sill, and this in one piece running the length of the sill. Dimensions and welding specifications are the same as for the side sills.

Gas Turbines

(Continued from page 51)

load of 50 per cent, the unit, fuel consumption per ton mile is increased by 40 per cent.

English Metropolitan Vickers Unit

Details of this 3,000 hp. unit known as 18,100, are shown in Column 3, Table 5. It will be noted that the electric transmission employs motors on all six locomotive axles and even with this liberal transmission according to European practice, it has the unusual weight ratio of 96.5 lb. per horsepower.

As indicated in Table 5, it works at a maximum temperature of 1,300 deg. F. with an optimum efficiency of 18 per cent. It burns distillate similar to that employed with diesel engines.

This unit was delivered at the end of 1951 and went into shake-down service early in January 1952. These runs included the hauling of unusually heavy trains.

The first revenue trip was made early in April and it was in regular revenue operation up to the middle of September 1952 when the unit was taken out for revisions to control circuits and other minor troubles.

In this operation of approximately eight months, the unit ran 42,000 miles and the turbine operated 1,237 hours. The fuel consumption obtained with this unit averaged approximately three gallons per mile and according to A. W. J. Dymond, the efficiency in comparison with steam locomotives was similar to that already outlined for the Brown Boveri unit. Up to August 1953, 116,429 miles were operated during which time it was in service approximately 10 months with an overall load factor of 58.2 per cent.

The period of operation was altogether too short to indicate any trend in maintenance as various modifications are still being carried out with the view to limiting maintenance to a minimum.

The chief difficulty with the Brown Boveri unit No. 18,000, is the short life of the combustion chamber lining. The distortion and wasting of this liner has pointed consistently to the difficulty of obtaining satisfactory combustion of residual fuel over the entire range of operation. Arrangements have been made with the Shell Petroleum Co. in cooperation with the locomotive manufacturer and the railway executive, to develop combustion chambers and method of combustion to overcome these difficulties.

In commenting on Table 4, we have shown that the flexibility of the motor transmission system with this unit is very limited, giving a ratio of only 1.47 between maximum and continuous speeds whereas with diesel locomotives in U. S. freight service we use ratios up to 7.

It has also been pointed out that in railroad application a good thermal efficiency would be required at 20 per cent to 30 per cent of the maximum output and that the efficiency at full load was of little significance.

Conclusion

The application of the gas-turbine locomotive to Class I railroads will depend entirely on its economics. If the gas-turbine locomotive should prove cheaper to operate than other types of power, it will prevail.

We have shown however, that the number of locomotives required to operate our railroads, is quite limited and the horsepower required is surprisingly small. It is therefore essential that in the introduction of a new type of power, that it should be arranged for general or universal use and not limited to special applications.

It is fortunate that the gas-turbine locomotive can employ the same traction motor transmission developed as standard for diesel locomotives. If, however, the gas-turbine locomotive and straight electric locomotive, of comparable outputs, employ some 50 per cent less transmission capacity than the established standard diesel locomotives, they are simply developing units with special and limited applications.

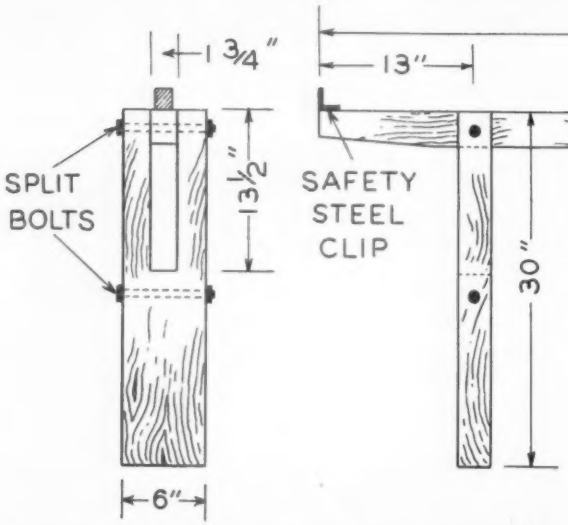
In order to cover the field of general application on our Class I railroads, a considerably smaller unit than the 4,500 hp. Union Pacific locomotive will be required. It certainly would not be economic to employ two 4,500 hp. Union Pacific gas-turbine locomotives to obtain the hauling capacity of a four unit 6,000 hp. diesel.

The significance of developing units that can be universally employed, is primarily that in order to meet competition with diesel and straight electric locomotives, a broad market with mass production must be created. Special applications, with custom built units, will not create this condition, but will tend to revert to the old steam and electrification practice, where every application was a special study in itself with no possibility of power interchange, even on connecting railroads.

The lifting bar (left) can be used on any type of surface along the rip track to take the weight off the side frame for many

jobs. It is inserted under the near end of the side frame (center) to raise it enough to renew the brass. For changing out a

pair of wheels (right) it can be used to raise and help maneouver the side frame clear for removing the wheel set.

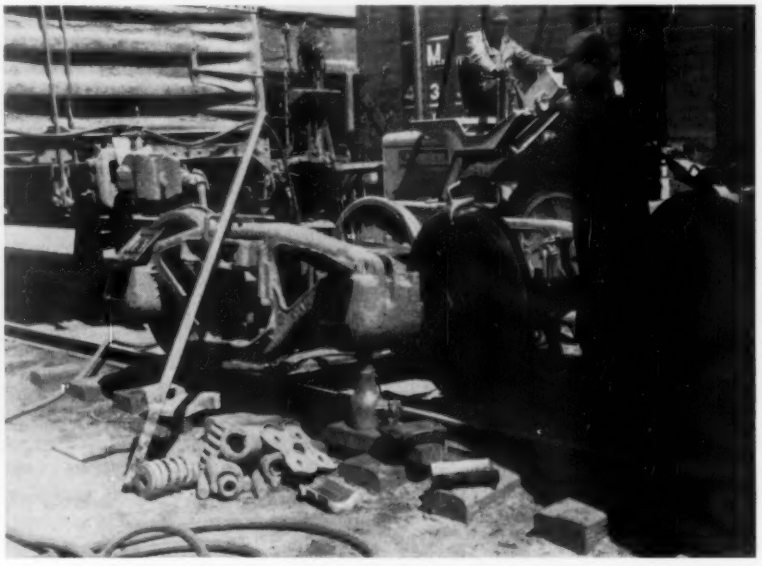


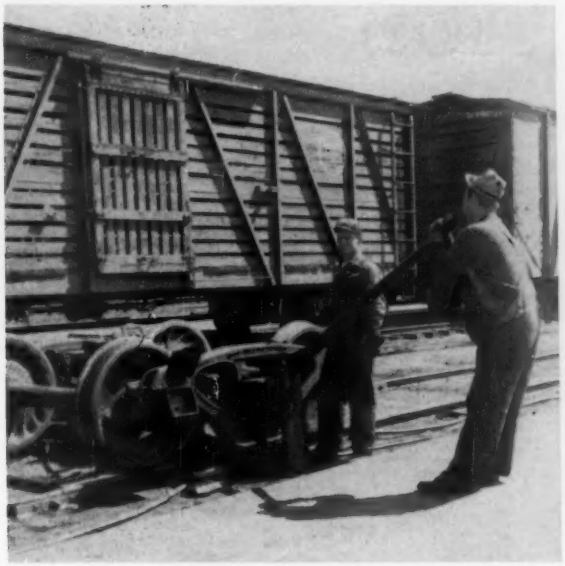
This is how the lifting bar is made, mainly from a couple of pieces of oak, bolts and a safety clip.

Handy Lifting Bar Speeds Rip Track Work

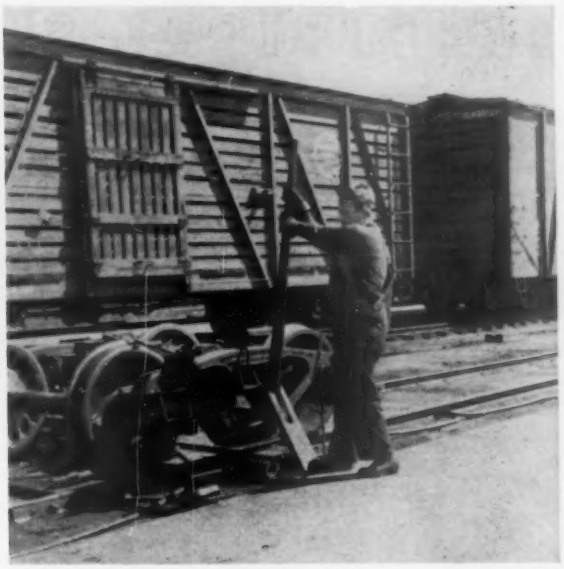
What at first appears from the illustrations to be a rather simple device is in reality about as handy and versatile a gadget as can be found for rip track work. The device is a lifting bar that can be made easily and quickly from a couple of pieces of wood. Developed at the Dupo, Ill., rip track of the Missouri Pacific, the bar simplifies nearly every phase of truck work from renewing brasses to changing wheels, and is light enough to be carried about by one man.

Removing the wheel set with a mobile hoist after the free end of one side frame has been set on wood blocks to support it. The side frame on the opposite side, after removal of the brass and wedge, is supported by an air jack (right) with the box at axle level.





Another operation for which the bar is useful is raising the bolster into running position on the partially assembled truck.



With the bolster temporarily held in place, the spring plank can be slid into place with the stand wedged against edge of concrete.

Referring to the drawing, the bar consists of a 30-in. stand and a 6-ft. lever. Both are made of oak, the cross section of the stand being 2 in. by 6 in. and the cross section of the lever being about 1¾ in. by 3½ in. The lever has a safety steel clip on the lifting end to keep the object being lifted in proper position and to prevent rapid wearing of the wood. The safety clip, which is securely fastened to the bar, is made from a piece of angle iron.

Building, 18 ft by 16 ft, built entirely from scrap box-car parts.

Steel box-car body with cement floor is used to store painting supplies.

Novel Uses for Old Box Car Parts

One road has found several ingenious uses for certain box car parts no longer suitable for normal freight service. In one case the shop forces made a paint shop from an old steel box car body, a purpose for which the car body was ideal as it makes a completely fireproof structure. In another case a building 18 ft. long by 16 ft. wide and 6½ ft. high was built completely from old car parts. Both have concrete floors.

The roofs and sides are both made from box car doors, as are the entrance doors to the building. The roof gables are made from ⅛-in. scrap box car side sheets. The rafters and roof braces are made of angle iron ⅜ in. by 3 in. by 3 in. The building is completely fireproof, and is used principally for storing welding machines, acetylene torches and hand tools.

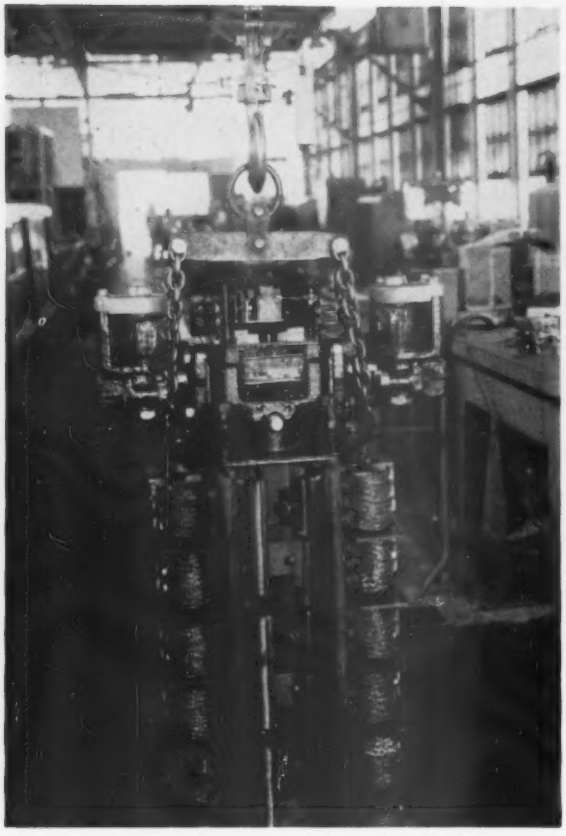


Fig. 1 (upper left)—The reverser as it is lifted in the sling.

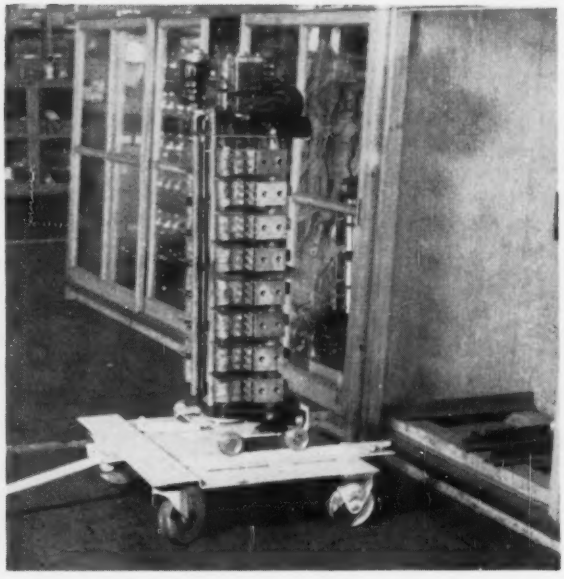


Fig. 2 (upper right)—The reverser on the truck for moving to the storage cabinet.

Handling Reversers Without Damage

Diesel-electric locomotive reversers, after being reconditioned in the Spencer, N. C., shops of the Southern, are stored in dust-proof cases until they are replaced in a locomotive. The cases have sliding glass doors, so the location of each overhauled part is visible without the need of opening a door.

Most of the work on the reverser is done on a bench

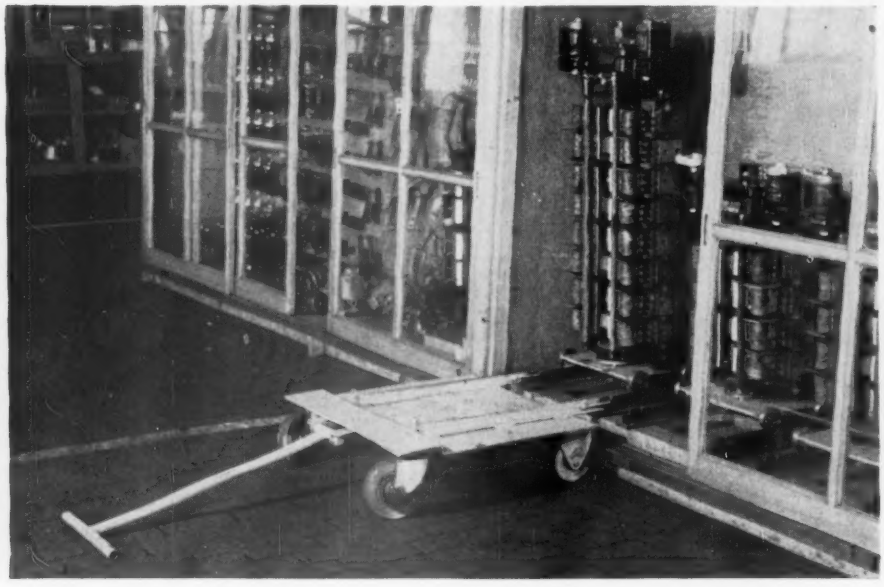


Fig. 3—When the tracks on the truck and in the cabinet are locked end to end, the reverser is rolled into the cabinet.

with the reverser lying on its side. When the work is finished a small four-wheeled cart is bolted to the bottom of the reverser. The wheels of the cart are grooved to fit a track made of two pieces of angle iron.

The sling, Fig. 1, is then applied and the reverser lifted with a hoist as shown, the chains of the sling sliding around 90 deg. as the reverser is lifted from a horizontal to a vertical position. The reverser is then lowered onto the small rubber-tired truck as shown in Fig. 2. Two of truck wheels are fixed and two are swiveled. On the bed of the truck are two tracks made of angle iron which fit the grooves of the wheels of the reverser. Stops keep the reverser from rolling off the truck.

If the reverser is to be stored, the truck is placed as shown in Fig. 3. Angle-iron track in the cabinet matches that on the truck and when the two sections of track are placed end to end, notches in the truck hold the two tracks in line and wire loops pinned to the truck track drop into slots in the cabinet track and hold the truck in position until the controller is rolled off the truck into the cabinet.

The reverse procedure is used to remove the reverser from the cabinet and the truck is used to move it to any place it is needed when the complete control equipment is assembled.

Lights for Continuous Ore Movement

Ore shipment on the Great Lakes is an around-the-clock operation while the lakes are open, and ore loading docks must have adequate light for 24 hours each day.

The lighting system shown in the illustration was installed by the Great Northern during the 1952-53 winter off-shipping season, on two of its four iron ore loading docks at Superior (Allouez), Wisconsin. The new lights which were placed on docks No. 1 and No. 2, consist of two steel floodlight bridges on each dock. They are placed about one quarter of the way from the outer and inner ends of the dock, respectively.

The overhead cross member of each bridge mounts five 1,000-watt floodlights, directed toward the end of the dock, five 750-watt floodlights directed inward, and five 300-watt reflector-type lamps on the underside for lighting the area under the bridge. The lighting units are 80 feet above the deck of the dock, and 160 feet above the water line.

The lighting system which illuminates the working area on the docks, also supplies light in the slips between the docks. It has proved highly satisfactory.

The old lighting system consisted of reflector-type lighting units, suspended from cables strung across the dock from 30-ft. poles, placed at 120-ft. intervals along the dock. There were five lights on each string, and 19 strings on the longest dock, No. 1. A section of the older type lighting can be seen at the extreme right in the photograph on dock No. 3.

A shortcoming of the older type system was that cables and lighting fixtures were corroded by stack gases from the ships lying alongside. The structural members of the new lighting system are heavy enough, so that a thorough paint job every few years should give adequate protection. The lighting fixtures are also more accessible for painting.

In addition to the lighting, a gantry crane was installed on dock No. 1. It spans four tracks and travels the full length of the dock on rails located between the outer tracks and the spout control mechanism. The function of the crane is to place a shaker on cars to dislodge ore which does not readily run out of cars when the doors are opened. The crane is powered by a diesel-electric generator set and is equipped with two motors, one for hoist operation, and one for propelling the crane along the dock. For night work, the gantry has eight reflector-type lamps on its underside for lighting the working area under the crane.

Night view taken from the inboard end of dock No. 3, showing the east side of dock No. 2. The older type lighting system may be seen at the extreme right.

Photo by Durant Barclay, Jr., Virginia, Minn.

The through-type oven with both doors open serves as a door between the two shops.

Oven Serves Two Shops

Full advantage of a Despatch through-type oven is taken by the Erie shops at Marion, Ohio. The generator and traction motor shops are separate from each other, and the oven is placed so it may be used from either side. It thus serves both shops as an oven, and since the track for the oven car runs all the way through, it can be used to transfer motors and generators and other equipment when not in use as an oven.

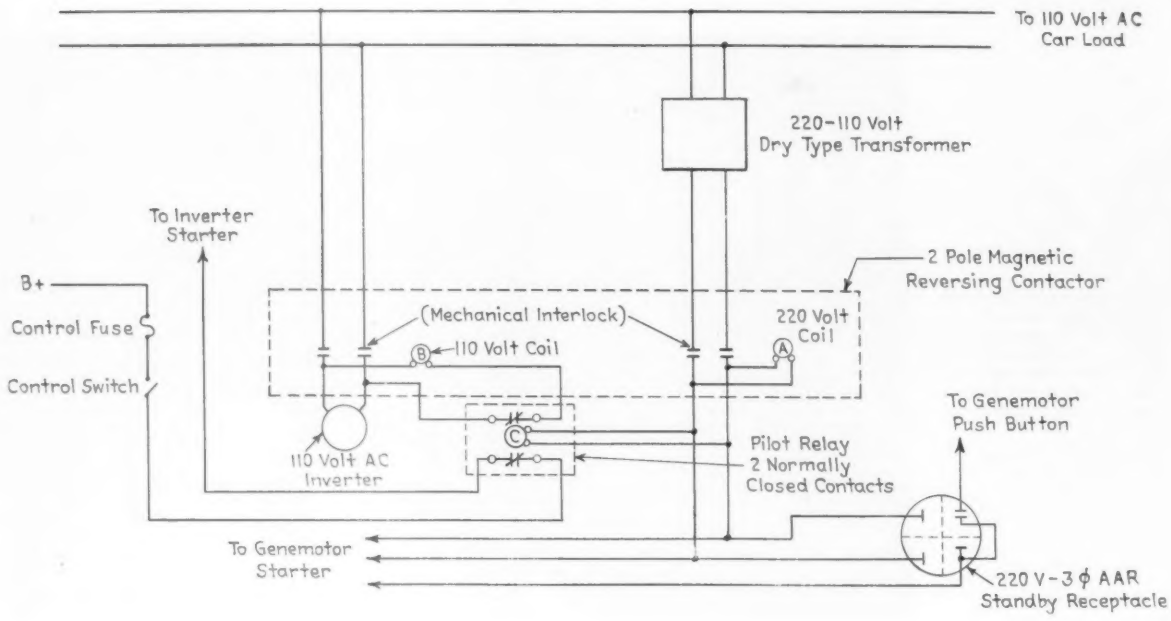
Standby Circuits for Dining Cars

By David H. Noble

Dining cars with mechanical refrigeration require special consideration during terminal layovers. Generally the kitchens are kept stocked, and refrigeration must be kept in service to prevent food spoilage. This, in turn, requires constant standby operation of generator and inverter, and means heavier wear of bearings, brushes, commutators, and batteries. The final results are increased maintenance costs and shorter service life of equipment.

Most diners are equipped with alternating current refrigerators, and a special transfer circuit can be installed to furnish a.c. power directly from the 220-volt standby line. With this arrangement a magnetic reversing contactor is employed to switch the feed to the car a.c. load from the inverter to the standby circuit. Under normal operation, the inverter furnishes power; when a standby cable is applied, the normally closed contacts on a pilot relay open, dropping out the inverter contacts and breaking the control circuit to the inverter starter, stopping the machine. At the same time, the other reversing contacts are closed, and the load is supplied through the 220-110-volt dry type transformer from standby.

No change is made in the normal genemotor standby circuit, and the genemotor can be operated for battery charging in the regular manner. The wiring diagram shown below applies to single phase inverters, such as the Safety motor alternator. For three-phase amplidynes, a three-pole reversing contactor is employed.

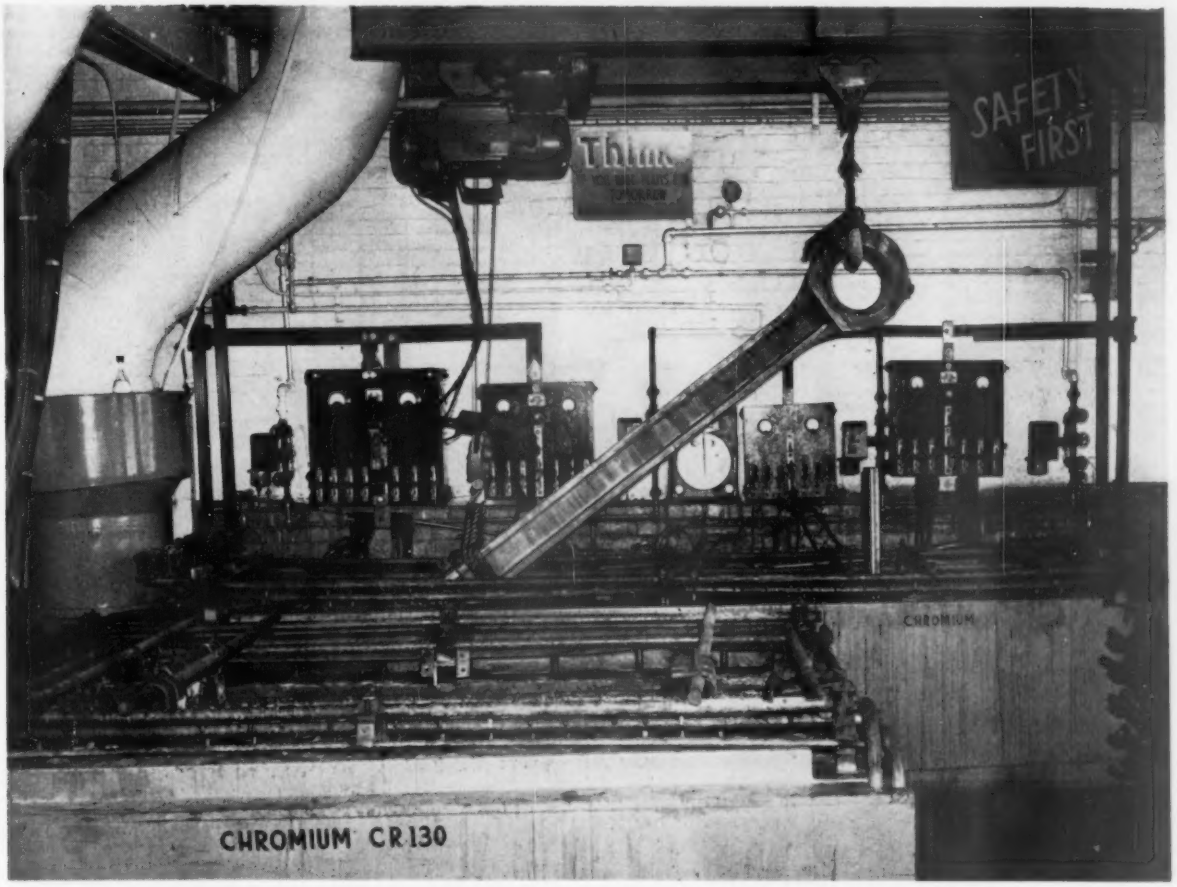


Hard Chrome Electroplating for Wear Resistance

By T. R. Boggess

Norfolk & Western Railway Company

By chrome plating the piston rod of this hydraulic accumulator pump, the need for repacking the glands practically disappeared.



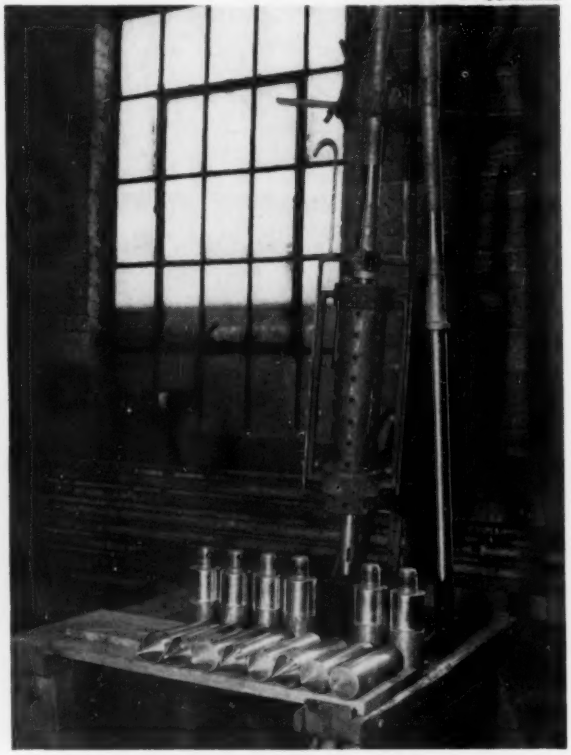
A locomotive main rod is shown suspended with one end in the tank, being hard chrome plated on the lateral wearing surfaces. Rods weighing up to 1,900 lb. and more than 12 ft. long can be handled. The large tank at the back is 154 in. long, 30 in. wide, 36 in. deep, and holds 785 gal. of hard chrome solution. This solution at a temperature of 131 deg. F. and current 3½ amp. per sq. in. will deposit .001-in. thickness in 50 min. The tank in front is the new self-regulating chromium bath CR-130. This solution at a temperature of 118 deg. F. with a current 3½ amp. per. sq. in. will deposit .0015-in. in 50 min.

➤ *Continued*

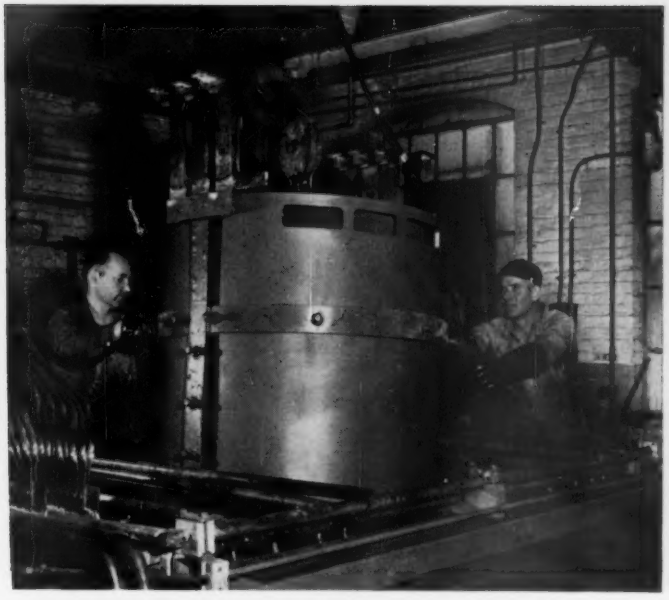
Crank pin roller bearing cups plated with hard chrome after a six-month test on a 4-8-4 streamlined passenger locomotive showed a wear of only .002 in. against a wear of .055 in. on unplated cups operated the same period of time on the opposite side of the same locomotive. The unplated cup required a sleeve to bring it back to contour, which costs several times more than plating, and the plated one could still be used. The photograph on the left shows the unplated bearing as removed from the locomotive. The one on the right shows the bearing after having sleeve applied and chrome plated. By plating the bearing cups, maximum service life of the bearing is obtained with a minimum of maintenance. In addition, the service life of rod bushings working thereon is greatly increased.

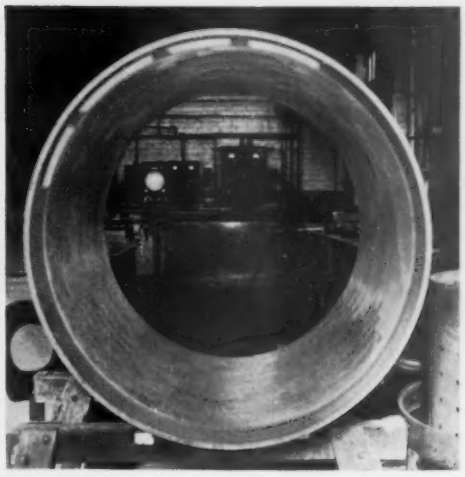
➤ *Continued*

Left: Brake head pins for passenger car truck. The pin shown at right is case-hardened and chrome plated, used without lubrication. It was removed from service for study after accumulating 789,000 miles. The remainder of the chrome plated pins in this truck are still in service, and are in good condition after more than a million miles.



The pin shown at left was case-hardened only, used with lubrication, and removed from service after accumulating only 163,000 miles. Right: Shown front to back, car centers for grinding machines, eccentric crank pins, and two valve stems one racked for plating. Chrome plating has increased life of these parts 4 to 5 times.





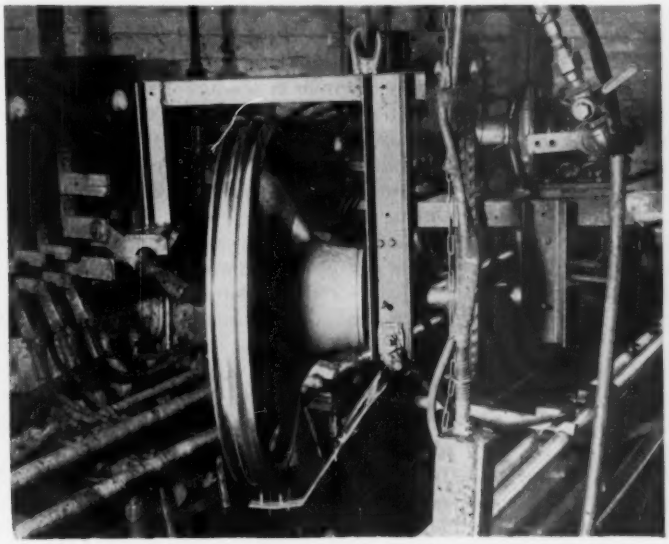
Low pressure cylinder bushings, 39 in. inside diameter and 38⅞ in. long for 2-8-8-2 Mallet locomotives, Norfolk & Western Class Y6, are hard chrome plated on the inside diameter to give longer service life to the bushing and the piston packing.

The picture at the left shows a bushing racked for plating and the one at the right shows the inside of the bushing after plating.

THE use of hard chrome electroplating by the Norfolk and Western on wearing surfaces of various parts for machines, locomotives and passenger equipment cars results in great savings in both labor and material.

The saving in material is not always made by plating an entire part, but, as in the case of an expensive gear where, by plating the small wearing portion of the shaft, the whole gear can be reclaimed. Often the greatest saving is in the labor involved in renewing the part, as it is sometimes necessary to spend a great deal of time in dismantling and rebuilding in order to replace a part which is inexpensive in itself. Since the resistance to wear of plated parts is many times that of unplated parts, the comparatively small cost of plating is more than justified. Plated parts not only last much longer, but give higher efficiency during their lifetime than would be possible with unplated parts which wear more rapidly.

Some examples of the use of hard chrome electroplating are shown in the illustrations. In the case of the first one, showing the hydraulic accumulator pump, it had been necessary to repack glands every 30 days. Since plating the piston in September 1948, it has not been necessary to replace the packing.



Shown on the left is a piston head for a 4-8-4 streamlined passenger locomotive, N. & W. Class J. After becoming worn, the width of the grooves is brought back to standard by the application of hard chrome plating. These piston heads are 26⅜ in. outside diameter and the photograph shows the method of racking for plating. The rack is equipped with an air motor and the piston head revolves slowly in the plating solution to give an even plate since they are not ground after plating. On the right is a roller bearing journal box for passenger car trucks. These are reclaimed by decreasing the inside diameter .065 in., and grinding.

From the Diesel Maintainer's Note Book . .

What a Battery Will and Won't Do for You

By Gordon Taylor

A storage battery in an automobile is something concealed under the hood that the average motorist does not think about until the starter fails.

That condition sometimes exists on a diesel locomotive. Not enough attention is paid to the battery until it fails. Then a dead battery means a dead diesel.

Now for a few questions on the subject of dead batteries and what happens to them.

No, my friend! Dead batteries do not go to heaven; the maintainer who finds one usually consigns it to another place.

Seriously, a discussion of the causes of battery failure may prevent diesel failures, which is the real object of this note. The ordinary causes of battery failures are as follows:

1. Blown fuse, or broken connection in battery charging circuit.
2. Failure of auxiliary generator.

Nearly everyone is familiar with the above mentioned causes of failure, and such troubles can be eliminated by an alert electrician or inspector checking the battery charging meter before the unit is dispatched in service.

After the unit starts out on the run, it is then up to the crew to be alert and note the battery charging ammeter to be certain that if battery charging ceases, steps are taken to check fuses or circuit breakers in accordance with existing instructions.

This article and the following one are the first of a series based on the experiences of men who operate and maintain diesel-electric locomotives.

But, you say, "What about the battery that seems to be charging okay but finally fails?"

I am glad you asked that question. It gives me an opportunity to stress points that some battery maintainers overlook.

The very best and most reliable guide that a battery maintainer can use is a hydrometer. If the acid solution or electrolyte checks okay with the hydrometer, you may be sure that the cell is in a healthy condition.

The only drawback to using the hydrometer is that it is a little messy, and troublesome to use. As a consequence, many maintainers give it only a token use. They check one cell (the pilot cell), and if it is right, they give the green light to the whole battery.

The trouble is that the readings are not frequent enough to serve as a reliable check on all cells. As a result, certain cells may become sulphated, and in that condition the charging current does not keep the plates in a healthy condition. The entire plate surface must be in good condition in order to produce full current output.

A storage battery does not store electricity. It produces electricity by electro-chemical action that takes place when the positive and negative plates are in a solution of sulphuric acid. All that the charging current does is to restore the battery plates to their original chemical condition (the same as they were before discharge), so that the plates may again generate current.

In the act of discharge, or the production of current, the acid leaves the solution and goes into the plates, leaving a weakened battery solution or water, and lead sulphate is formed on the battery plates.

When charging, it is necessary for the charging current to convert the lead sulphate on the positive plates back to lead peroxide, and the lead sulphate on the negative plate is reduced to spongy metallic lead. The acid which disappeared from the electrolyte during discharge, is driven from the plates during charge and the electrolyte becomes more dense and the cell is then considered charged.

When a battery is left standing too long in a discharged condition, that aggravates the sulphated condi-

tion. A battery that is completely discharged should be promptly recharged.

A storage battery that is "floated" constantly on a charging circuit does not have the opportunity of being cycled through a discharge-charge cycle which is the best means of keeping the battery in a healthy state. Consequently, when a battery has a lot of half dead cells, it is necessary to get the battery off the locomotive and give it a cycling—charge-discharge—treatment to get rid of the sulphate and restore the cells to healthy condition. The battery solution is equalized, and generally the battery will then give good service.

When the hydrometer first tells you that the gravity of electrolyte is not holding up, it is a good idea to change the adjustment of the voltage regulator. If the regulator setting is 74, try raising it to 75. Let the unit run a trip or two to see if the gravity reading has come up. If so, operate at 75 volts for a while. If gravity reading does not rise to proper value with the 75-volt setting, then try 76 volts temporarily.

You will find that all batteries do not respond in exactly the same manner. You have to experiment a little with voltage regulator settings.

Do not overcharge the battery as that will damage it. Overcharge will make itself known by too high a gravity reading, overheating of the battery, and excessive gassing; which, in turn, will require flushing or addition of water at too frequent intervals.

Undercharging makes itself known by low gravity readings. It is also indicated by the infrequent need of water to maintain acid level.

Summary

Get hydrometer conscious. Use the hydrometer on all cells at least once a month. Check the pilot cell at each maintenance period. Keep cells flushed with water to proper level. Note the need of flushing; it will tell you a great deal.

Do not over-flush or needlessly spill water over the tops of the batteries. Keeping the battery box dry and clean eliminates low voltage grounds.

Change the adjustment of the voltage regulator as needed to provide the voltage best suited to maintain the battery in a charged condition.

If you have batteries that do not respond to the treatment outlined above, report such cases, since they will probably have to be overhauled at the system battery shop.

Batteries rarely die under the care of a live, alert electrician. Send the batteries out in good condition, and the chances are the crews will bring 'em back alive. Live batteries are the only ones that keep diesels rolling.

Why the Diesel Didn't Load Up

At a certain large terminal a three-unit freight diesel was being dispatched when it was found that one unit would not load up. It might be mentioned that the unit had arrived in the terminal an hour or two earlier in good working order.

When it failed to load up, a hurried attempt was made to locate the trouble, but without success. To save time in dispatching the train, the tonnage was reduced, and the unit was switched to the rear trailing position. The train left town late with tonnage for two units.

At the next large division point, the electrical foreman boarded the unit, and diagnosed the trouble as being in the shunt field contactor. That seemed logical, especially since the unit loaded up after the contactor had been changed.

When I called to learn what had caused the trouble, I was told that: "it must have been an open coil in the shunt field contactor." Being a curious individual, I wanted to know more about the nature of the open coil circuit. When I found that the entire contactor had been changed, I had the old contactor closely checked and there was nothing wrong with it.

That test indicated that the shunt field contactor was not at fault and that trouble was still riding the locomotive, awaiting an opportunity to break out again. The unit was out running, apparently okay, but since there was clearly some condition that needed correction, arrangement was made to give it close inspection on its return to the maintenance point.

The trouble shooter assigned to the job planned his inspection to start with the isolation switch and continue through the steps necessary to excite the main generator. He did not have to go very far until he found trouble in the form of loose interlocks on the starting contactor.

Now you know that after the starting contactor is operated and drops open, the interlocks on that contactor must provide a good circuit to make it possible for the shunt field contactor to operate.

If the shunt field contactor fails, there is nothing to provide excitation for the main generator, and a main generator must have its field excited in order to pick up its load.

It was also found that interlocks C and D on the series power contactors were in bad condition; that is, they were not in reliable working condition. Open or dirty interlocks on the S-14 and S-23 contactors will definitely interfere with the operation of the shunt field contactor.

This was a case where the operation of the units was depending on a very flimsy control circuit. When it was working, there appeared to be no trouble at all. When something happened to disturb the circuit, then the unit would not load. This case carries with it a very important lesson. Do not close out a case of trouble that seems to correct itself. You cannot depend on equipment to effect a permanent cure for itself.

Do not think that the first defect that you find is always the complete answer to your problem. The real cause of trouble may not be the first thing that you find. Try to convince yourself that the real trouble has been corrected, but be hard to convince.

DIESEL-ELECTRICS—How to Keep 'Em Rolling

23 Trouble Shooting

Finding trouble is partly an art —and partly science—and experience makes it much easier

A patient walked into the doctor's office, a couple of friends by his side. No special skill was required to tell that he had a broken arm—it was evident to anyone. But the doctor did have to use medical skill in setting the bone. Another patient walked in by himself, looking fine. He told the doctor he had been having severe headaches from time to time for several months. The doctor knew this might be the symptom for a dozen different ailments. He had to use medical skill in locating the cause of the headaches. This called for a check-up, tests and examinations. In other words, he had to do some trouble-shooting on the patient's body.

Now take the case of a locomotive. Suppose a leaking oil line is reported. You don't have to be a trouble-shooting expert to find that, but you do have to know how to fix it. On the other hand, suppose the report is, "unit not loading". That's another story. It could be caused by a dozen different things. You will have to go to work to find which one it is. This calls for skill in locating trouble. Just how to go about it can't be stated in so many words—it's a combination of knowledge and judgment.

In this article, we won't attempt to go into all of the many things that could happen in the electric system of a locomotive. Instead, we will deal with some of the fundamentals that will be useful in locating troubles when they occur. To the experienced electrician this will probably sound like old stuff. But even the best football player keeps drilling on fundamentals like kicking, passing and blocking. For anyone not experienced in maintaining electric control equipment, it will be a good foundation. If he learns the fundamentals well, he will be able to make more sure and rapid progress in this work.

What to Do?

When a trouble is reported, you don't just start taking things apart. Neither do you start looking without any idea of what you are looking for. You'll save yourself a lot of time and trouble if you sit down and do a little thinking first. Remember the story about the fellow who couldn't get his car started. Right away he grabbed a wrench and began to take the engine apart. But he didn't find anything wrong there. Finally he remembered the gas tank—a glance showed it was empty!

Your eyes, ears, nose and hands are the best equipment for locating troubles. There are, however, some simple tools that will help a lot. Most of them are light and inexpensive. If you don't have them you can make them from things found around most electric shops. Let's take a look at some of them shown in Fig. 1.

First is a pair of jumper or clip leads. They are probably the simplest and most useful trouble shooting item that you can have. As you see, they can be made from a couple of lengths of control wire and some clips. They are specially handy when you wish to use battery voltage to check the operation of some electric part, such as a relay or contactor. They are also useful for jumpering around suspected open circuits, such as circuit breakers, etc.

Another useful item that is easy to make and carry is a test light. It is much safer to use than a jumper because there is little chance of causing a short circuit. It can be made from a couple of lengths of control wire, a low voltage bulb and a resistor for cutting down the battery voltage. The low voltage bulb and resistor make the test light useful over a wide range of voltages. You will find it specially good for tracing out a "hot" wire.

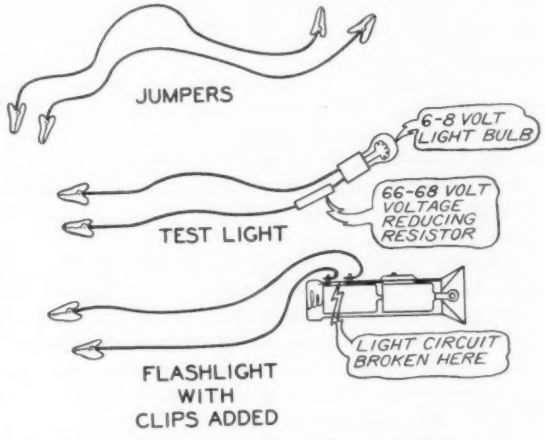


Fig. 1—Some simple and useful helps in trouble shooting.

This is the twenty-third and final part of this series of articles on the maintenance of diesel-electric equipment. This article is written by B. L. Judy, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

Fig. 2—Combining several meters in one, the analyzer is a very handy trouble shooting tool.

Fig. 3—The megger is a big help in locating high-resistance grounds.

Still another handy trick is to add a set of clip leads to your flashlight, as shown in Fig. 1. This will more than double its usefulness. It can be a big help in locating an open circuit when the locomotive battery is not connected. But be careful not to connect it across the battery. If you do you will probably have to get a new flashlight bulb. One advantage of this gadget is that whenever you have your flashlight you will have a trouble shooting tool.

One of the old standbys is a bell set. It can be made in the electric shop from wire, clips, a bell and some batteries. It serves the same purpose as the modified flashlight, only you get a bell signal instead of a light. Because it is heavy to carry, it is generally used to ring out new wiring, rather than for trouble shooting.

The analyzer, Fig. 2, is rather new around railroad shops. But it is coming into more general use. It combines a number of instruments into one. This means you have to carry only one meter around instead of six or eight. With reasonable care and wise use you will find the analyzer to be by far the best single trouble shooting tool available.

Finally there is the megger, Fig. 3. You use it mostly when looking for high-resistance grounds. It is good for this because the high voltage it develops will give a reading through these grounds. It has one disadvantage, however. If you use it on a circuit where the insulation is already weak, it may create new grounds.

Let's take a simple example and see how you could go about shooting trouble. Suppose you have a single-unit locomotive on which the fuel pump won't run. If you look on the wiring diagram you will see the fuel pump motor circuit something as shown in Fig. 4. The fuel pump contactor coil circuit is shown in Fig. 6.

Preliminary Tests

First, try the exhauster motor and the motor generator. If they run you know that the fuel pump contactor, *FPC* in Fig. 4, is picked up and making good contact. If they won't run, then be sure that both fuel pump circuit breakers, *173* in Fig. 4 and *169* in Fig 6, are closed. Try turning them on and off a couple of times to be sure that they are closed.

Next, see that you have power for the engine room or control compartment lights. If not, then see that the batteries are connected, that the battery switch is closed and that the battery circuit breakers are closed. The lights are fed from the *50* wire. So when you have lights, you know that the *50* wire is "hot".

If the *50* wire is "hot", look at the fuel pump contactor. Be sure that it is picked up and that the tips are making contact. Finally, look at the pump motor. Feel the plug to see that it is tight. Put your hand on the motor to see if it is hot — it may be stalled. You may also smell burned insulation if it is stalled. So far you have not used any tools. In fact, you can find many of your troubles without the help of tools.

Detailed Tests

If the simple tests just described do not find the trouble you will have to go further. A good place to start is at the fuel pump motor plug. Turn the fuel pump circuit breakers off. Remove the connector plug from

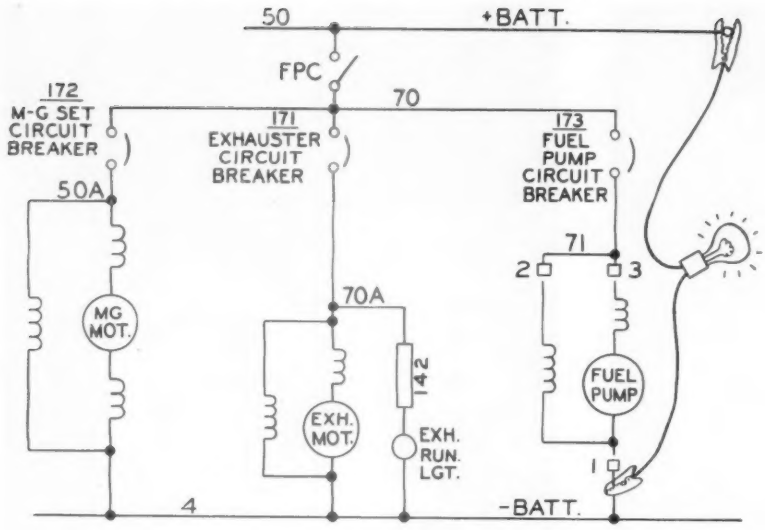
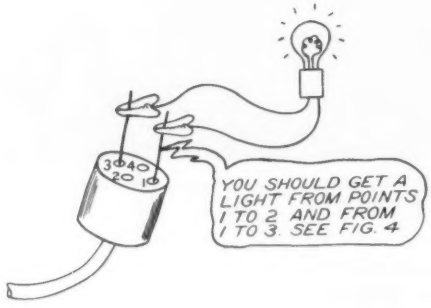


Fig. 4 (Left)—One type of fuel pump motor circuit.

Fig. 5 (Below)—How to test the fuel pump motor plug.



the motor. Then close the breakers again. Connect a test lamp across the plug as shown in Fig. 5. If you get a light the trouble is pretty definitely in the motor itself. You can make this same check with the voltmeter part of an analyzer. The ohmeter part of the analyzer can be used to check out the motor if the trouble appears to be there. Compare the readings against the values given on your schematic wiring diagram or in your instruction book.

If you find that the plug is dead you'll have to back track. Figure 4 shows how to make sure that the *4* wire at the receptacle is good. Connect one lead of the test light to any convenient *50* wire. Then check all plug points. One of them should give you a light if the *4* wire is good.

Now let's back track on the battery positive wire. You can do this by connecting one lead of the test light onto any *4* wire and then checking back until you get a light. Say you try the *71* wire on the circuit breaker, Fig. 4, and get no light. Then you try the *70* wire on the circuit breaker and get a light. This means that the circuit is good as far as the circuit breaker. However the circuit is not good through the breaker. So the breaker must be the cause of the open circuit.

Suppose you find that the fuel pump contactor is not closed. You will have to check out the circuit in Fig. 6. Connect the test light onto a *4* or battery negative wire. Then start out at the contactor coil. If you get a light on the plus or *16A* side of the coil, then the circuit is good that far. A dim light on the negative or *4* terminal of the coil means that the coil is good. The "open" must be in the *4* wire to the coil. If you get no light on the negative terminal, the coil is most likely open. In this case check the coil resistance with the ohmeter part of an analyzer. Compare the reading with the value given on the schematic diagram or in the instruction book.

If the *16A* wire is not hot then go up to the *16*, the *16B*, and finally the *50* wire on the circuit breaker, Fig. 6. In this way you can find out how far down the circuit the *50* wire is hot. Say you get a light on the *16B* side of *167* resistor and not on the *16* side. This means that the resistor is probably open. A word of caution here though. The *167* resistor might have a high resistance, say 1,000 ohms. Then you would not get enough current through it to give you a light. The voltmeter part of an analyzer can be used to check out such high resistance circuits. Even though you cannot get a light you can get a voltage reading.

If you have a high resistance circuit or if the control voltage cannot be turned on, an analyzer used as an ohmeter is ideal. To check the circuit we have just been looking at, you would connect it as shown in Fig. 7. It should read the resistance of both the fuel pump coil and the *167* resistor. If it reads open, start with the bottom lead and work up. Hit the *16A* wire, the *16* wire and so on until you get a complete circuit. The *4* wire was disconnected so that you wouldn't read the resistance of other parallel circuits between the *50* and *4* wires. When using an analyzer for this purpose always be sure that the circuit is dead, otherwise you will burn out the meter. A safe practice is to check the circuit for voltage with the voltmeter part of the analyzer first. Then you will be sure whether or not the circuit is dead.

You can also use a bell set to check out a circuit like this. Like the light, it will not work on a circuit with high resistance. So it is not too good for locating an open resistor in a complete circuit.

Now suppose you have a three-unit locomotive, and the fuel pump contactor won't come in on the trailing unit. The *16* wire in Fig. 6 that goes up into the train

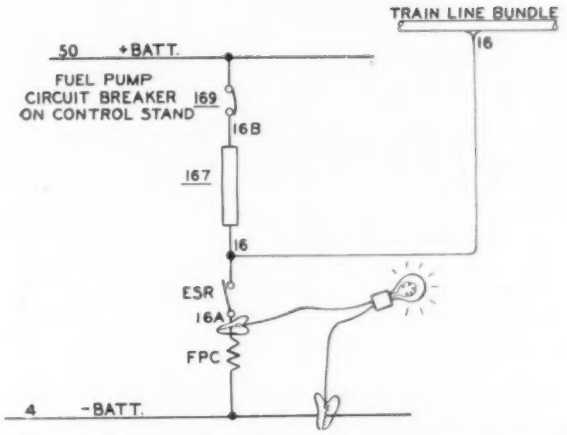


Fig. 6—Using a test lamp to check the fuel pump contactor coil circuit.

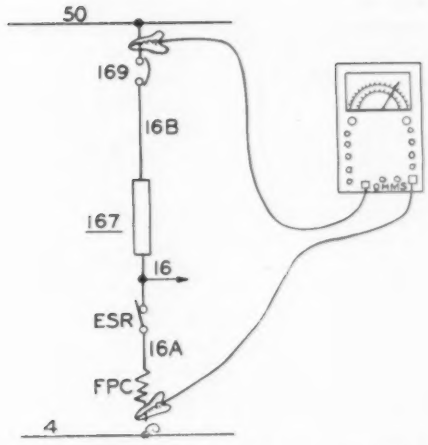


Fig. 7—Using the analyzer as an ohmmeter to check a high-resistance circuit.

line bundle feeds the fuel pump contactor coils on the trailing units. The chances are that this wire is open in the jumper between the second and third units. If the contactors won't pick up on either trailing unit, the open will be in the jumper between the first and second units. If the third unit is an "*A*" cab you can find out pretty fast by closing its *169* circuit breaker. If the third unit is a "*B*" cab then you'll have to check the *16* wire with a light or an analyzer to see if it is "hot". If it is, check out the rest of the circuit just as you did on the single unit. If the *16* wire is not "hot", back track towards the lead unit until you will find where the trouble is. From there you'll be able to locate the "open".

In these examples we have used a rather simple circuit. You may say anyone could trace out a circuit like that —how about the complex ones? Well, a complex circuit is always made up of a number of simple circuits. If you will take the schematic diagram, pick out a circuit at a time and check it out as we did this one, the job will be easy. At first you may find it helpful to sketch out the circuits. With a little practice, you will be able to check direct from the wiring diagram.

We have already looked at the troubles that can affect the operation of different pieces of equipment on the locomotive. Now we shall look at the troubles that affect the operation of the locomotive. These are system troubles rather than device troubles.

Most of the troubles can be divided into two groups. The first consists of those that develop in service. The second consists of those that result from shop work. How you look for a trouble depends largely on which kind it is. Let's examine each of these groups.

Troubles That Develop on the Road

These troubles are the ones you get at wayside and running maintenance points. Many of them will be reported by the train crews. They are such things as, "engine shuts down", "all engines shut down", "engine not loading", "no power at high speed", or "dynamic brake weak". As a maintainer, it is your job to take reports like these, figure out the cause of the trouble and then locate the fault. Usually you will have to do this while the baggage car is being unloaded.

It would take a volume to write down all of the troubles and their causes for a thing as complex as a locomotive. However, as you get to know your locomotives and your crews you will get to know most of the causes for reported troubles. At first, though, you will likely spend much time learning them. Sometimes you may have to ride the locomotive to see the trouble first hand before you can locate it.

For example, suppose you get a report on a unit which reads "engine not loading". You might know from experience that on this type of locomotive, in 9 cases out of 10 the trouble is caused by a resistor that opens up. Then it's easy to find and fix. If you don't know this though, you will have to start from scratch and trace the trouble down. You might go about it by asking yourself the following questions: Is it the engine? Is it the motors or main generator? Is it the electric control?

In each case, a quick check should give the answer, if you know the symptoms. Suppose that it turns out to be in the electric control. Then ask yourself: Is it in the power contactors? Is it in the excitation system? Is it in the governor? Is it in the engine control?, etc.

The answers to questions like these may not be easy to find. However, you will learn shortcuts for many of them. Also you will get to know the symptoms. Every answer that you get will bring you a step nearer to locating the trouble.

Troubles That Result From Shop Work

If you are changing out some equipment or if you are looking for troubles, you will have wires disconnected and things apart in general. When reconnecting there is always the possibility of a slip or an oversight. Carelessness with a paint brush or spray gun may also cause trouble. Many a control failure has been traced to a speck of paint on a contact tip. This is like a grain of sand in your eye—you can't see it, but it sure makes a lot of trouble!

Any error will usually show up in the final shop tests. So if you have trouble on these tests, the first place to look is where the shop work was done. If equipment was changed out or disconnected, ask yourself could this have anything to do with the trouble? Could the new

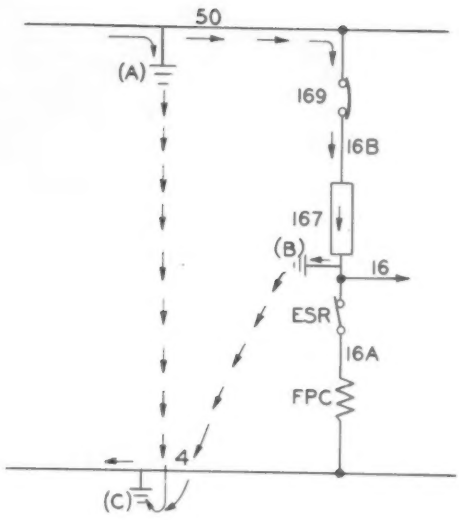


Fig. 8—How a ground can foul up a control circuit.

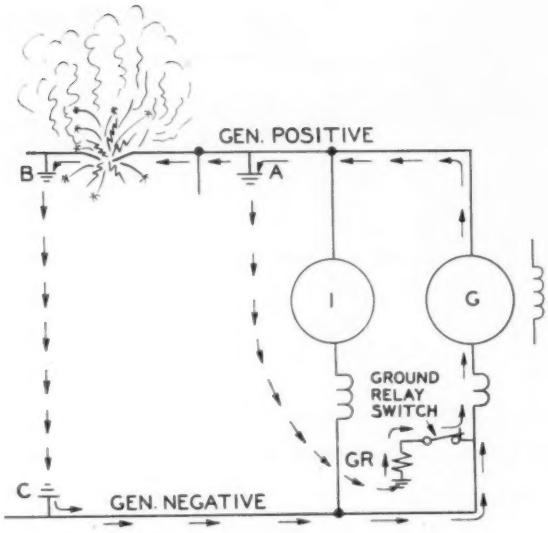


Fig. 9—How a power circuit ground can cause trouble.

piece that was put in be causing it? Or is the trouble resulting from a paint job? Of course it's best, if you have time, to thoroughly check out the circuits when a new device or new wiring is installed. Unfortunately, in many cases there isn't time to do this. But at least you know where to look if trouble shows up on the final test.

Sometimes these troubles won't show up until the locomotive gets out on the road. So if an unusual trouble is reported on the road, look over the recent shop work records. They will often give you a good clue. For instance, suppose you get a report of "no power above 30 miles per hour". You check the shop records and find that a transition relay was changed out the last time the unit was in for inspection. Right away you are pretty sure of the cause of the trouble. Probably a wire was misconnected, a terminal left loose, or the new relay was defective. A wire in the wrong place can cause troubles that were never heard of before. Sometimes such troubles can be most difficult to find. That's why a look at the shop records may give you a clue that will save you a lot of hunting.

Now let's take a look at some of the more difficult trouble makers:

Double Trouble

Sometimes it may take a combination of things to produce the trouble. These cases can be baffling, even to the experienced trouble shooter. At times you may find one cause of the trouble and fix it—yet still have the trouble. For example, you might not be able to get the fuel pump motor to run. In checking out the circuits you find that the *167* resistor, Fig. 6, is open. You replace it and the fuel pump contactor picks up okay. Still the motor runs for only a couple of minutes and then stops. This would lead you to suspect a circuit breaker. You check the breaker in the motor circuit, Fig. 4, and find it tripped. You examine the circuit breaker and find an overheated terminal. Maybe the connection is loose, causing the terminal to overheat and trip the breaker. So can't always be sure when you find one cause you have cured the trouble. If you remember this will help you avoid the mistake of only half fixing a trouble.

Intermittent Troubles

These are the ones that furnish material for the "fish stories" you hear from crews and trouble men. The report for such a trouble may go like this—"on a particular curve at a speed of 40 to 45 miles per hour, unit 'so and so' always trips the ground relay". In many cases, the only way to find the causes for such reports is by riding the unit. Many times you will find a stray loose washer, a free piece of wire, a loose terminal, or a wire with the insulation worn off at one spot causing the trouble. In some cases such troubles can be found in the shop. It takes a good analysis, a diligent search and good luck to do the trick. In one case a flat washer was found standing on edge in a terminal strip. Normally it was in a completely harmless position. Under the right conditions, however, it would fall over and short circuit two terminal studs. Trying to find this trouble in the shop was almost useless because then the washer was back out of the way.

Partially Failed Electric Equipment

A very common instance of such trouble is a partially failed relay or contactor coil. On a normal sequence test it may check out okay. However, as the coil heats up expansion may squeeze some of the wires in the winding together. This will short out part of the coil so it will not operate the contactor or relay. Repeated reports of a trouble on a particular unit may be traced to this. If you can pin the trouble down to a particular piece of equipment, the best thing to do is to make a careful measurement of the resistances as soon as the unit comes in, while everything is warm. Check these against the values on your wiring diagram or in your instruction book. If you can't make these measurements, the next best thing is to change out the coil and see if the trouble is corrected. Capacitors, rectifiers, and even worn or damaged mechanical parts can also cause partial failures.

No story on trouble shooting would be complete without a mention of grounds. They are in the "incurable disease" category. Volumes have been written on grounds and how to protect against them. We have time for only a look at the troubles that they can cause.

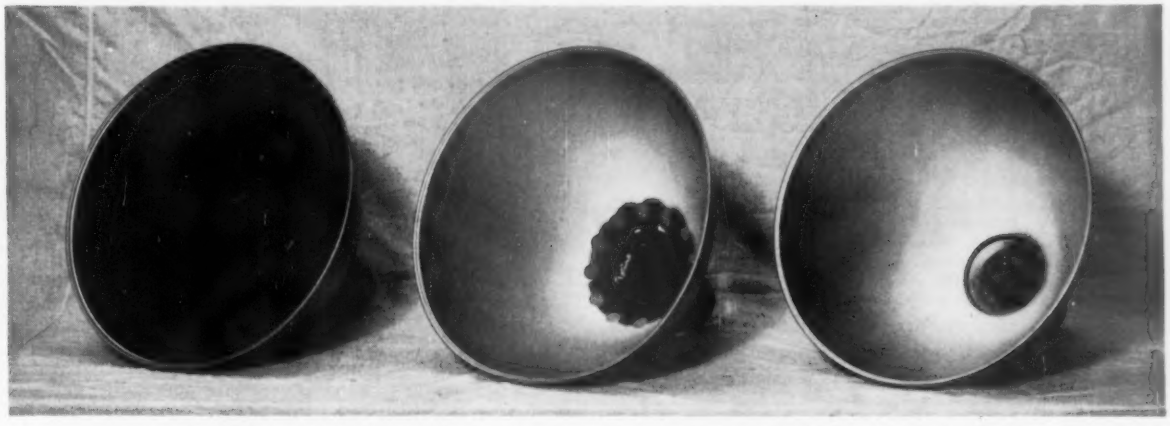
All of the control apparatus and its wiring on a locomotive are insulated from the locomotive body. If any of this electric system comes in contact with the locomotive body, you have a ground. Let's look at the control circuit shown in Fig. 8. Suppose there are grounds at points *A*, *B*, and *C*. The grounds at *A* and *B* are called positive grounds. The one at *C* is a negative ground. Negative grounds, in themselves, are not troublemakers. However, if you have them and then get a positive ground, you have trouble.

Suppose there is a positive ground at *A* and a negative ground at *C*. You can see that there will be an electric circuit through the locomotive body. Current will flow from *A* to *C* as shown by the arrows. This is a short circuit and the battery circuit breaker will trip. So in this case you would be plagued with a tripping circuit breaker or blown fuses. If it weren't for fuse or circuit breaker protection the wires carrying the short-circuit current would be burned out.

Now suppose you have a positive ground at *B* instead of at *A*. Current will flow from *B* to *C* as shown. Since this is a short circuit no current will flow through the fuel pump contactor coil. This means the contactor will not pick up. The short-circuit current would probably trip the *169* breaker. Most likely the *167* resistor would be overheated and would open up.

In Fig. 9, you see a sketch of part of the power or high voltage circuit. A positive and a negative ground here would produce some real fireworks. Protection against this is provided by the ground relay *GR*. One side of this relay is permanently connected to the locomotive body. If a positive ground develops, as at "*A*," current will flow through the ground relay coil and cause the relay to pick up. This will kill the generator output and prevent any damage. If the ground relay protection is nullified and a positive and a negative ground develop—you may get some real damage that will be easy to find but tough to repair.

Maybe you've heard it said that trouble shooters are born, not made. That is partly true. Trouble shooting is more of an art than a science. But you will find two things back of every good trouble shooter. The first is a thorough knowledge of the equipment. The second is plenty of trouble shooting experience. That's certainly a familiar pattern. Whether it's playing football, fishing or trouble shooting, the fellow who succeeds is the one who knows the details and keeps everlastingly at the job.



Three different types of Alzac Aluminum reflectors. All have been in service the same length of time.

What Ventilation Does For Lighting Maintenance

In the photograph there are three incandescent lamp reflectors made of Alzac aluminum. All have been in service the same length of time. The one on the left is not ventilated, and the other two are.

Ventilation in the center unit is accomplished by means of a ring of small holes in the metal of the reflector. The unit at the right provides ventilation simply by allowing space around the base of the lamp.

It will be noticed that the space in the center reflector above the ventilating holes is about as black as the unventilated reflector and apparently for the same reason. There is no air circulation, or at least very slow air movement, and the dirt settles out of the air and is deposited on the metal surfaces. In the lower part of the center unit and over the entire surface of the right hand unit, air movement is rapid and dirt does not settle. It is even conceivable that there is a washing action which would keep the surfaces cleaner than they would remain if there were no lamp in the reflector.

Tests made on reflectors of this kind showed the following results:

	Per cent light output	
	Ventilated Alzac Aluminum reflector	Non-ventilated Alzac Aluminum reflector
Initial	100	100
After 9 weeks	91	68½
Units cleaned	100	100
After two weeks	97	85½
After four weeks	95	78
After 12 weeks	93	61

QUESTIONS AND ANSWERS

Interchange Rules

This is the fourth installment of a new series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirement of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, will come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.—Editor.

44-Q.—What explanation can be given with respect to the presence of slogans of an advertising nature stenciled on railroad owned freight cars and the absence of such slogans on privately owned freight cars?

A.—There are no rules or rulings to govern such stenciling on railroad owned cars and such slogans are not objectionable thereon provided they do not interfere with markings prescribed by the A.A.R. Rules of Interchange or the Manual of Standard and Recommended Practice. However, in the case of privately owned cars, the findings of the Interstate Commerce Commission in Investigation and Suspension Docket No. 3887 govern and prohibit such special markings.

45-Q.—What is the intent of Paragraph (10-m) of Interchange Rule 32 as pertaining to roof and running board damage associated with other additional damage to a car which is caused by a storm?

A.—The exception in Paragraph (10-m) of Rule 32 was primarily incorporated in the rules to cover cases where it used to be quite common for the wooden roofs of older designs of freight cars to become blown off in ordinary wind storms when car doors were left open under certain conditions. However, where a car suffers other damage in a storm and the roof and running board details, etc., become damaged at the same time, the entire damage would be the responsibility of the handling line.

46-Q.—Where a car owner takes exception to a billing repair card involving charges for wheels and axles and returns same to the repairing road, may the repairing road change questionable dimensions specified for axle measurements?

A.—Under the provisions of Arbitration Decision No. 1722 which was rendered by the Arbitration Committee under date of April 7, 1933, the repairing road is not permitted to make alterations in axle dimensions shown on billing repair card after rendition of bill.

47-Q.—Where handling line renders a telegraphic report to car owner merely indicating that a certain defective car requiring extensive repairs is being held under owners responsibility, does this meet the requirements of Interchange Rule 120 insofar as stopping of per diem is concerned?

A.—It is the intent of the rules that the per diem should stop on the date of communication to car owner transmitting full information required by Interchange Rule 120, submitted either on a joint inspection certificate from or by means of a detailed letter.

48-Q.—Where air and steam pipes on passenger cars are found to be leaking and it is necessary to disconnect the pipe and reconnect same in order to stop leaks, may the car owner be billed for such work?

A.—Tightening of leaking air, water or steam pipes is not chargeable against the car owner regardless of whether or not pipe is disconnected to stop such leaks, per Section (a) of P.C. Rule 13, except as outlined in Interpretation No. 1 of this rule.

49-Q.—What charge may be made by repairing line for the application of stench bombs, smoke bombs, etc., to foreign cars so equipped?

A.—Where stench bombs or smoke bombs standard to car are renewed account defective or discharged and change of wheels at same location and handling line responsibility is not involved, charge for such renewal may be made versus car owner on the basis of Rule 105 for material and actual time consumed for labor. (Also see Paragraph (4) of Section (e) of P.C. Rule 7.)

50-Q.—Is charge permissible for renewal of pipe bracket portion of AB valve account threads stripped in cross-over connections, air brakes not being cleaned at the same time?

A.—As pipe bracket portion was not defective in body casting as specified in first note following Item 28 of Interchange Rule 111, charge in this case must be confined to allowance specified in Item 26 of Rule 111, for R. & R. of cap screws and bolts necessary for removal, etc., total charge not to exceed allowance specified in Item 16 of Rule 111.

51-Q.—Where one pair of wheels in unit type truck is changed under handling line responsibility and r" four dust guards in same truck require renewal, how should billing be handled?

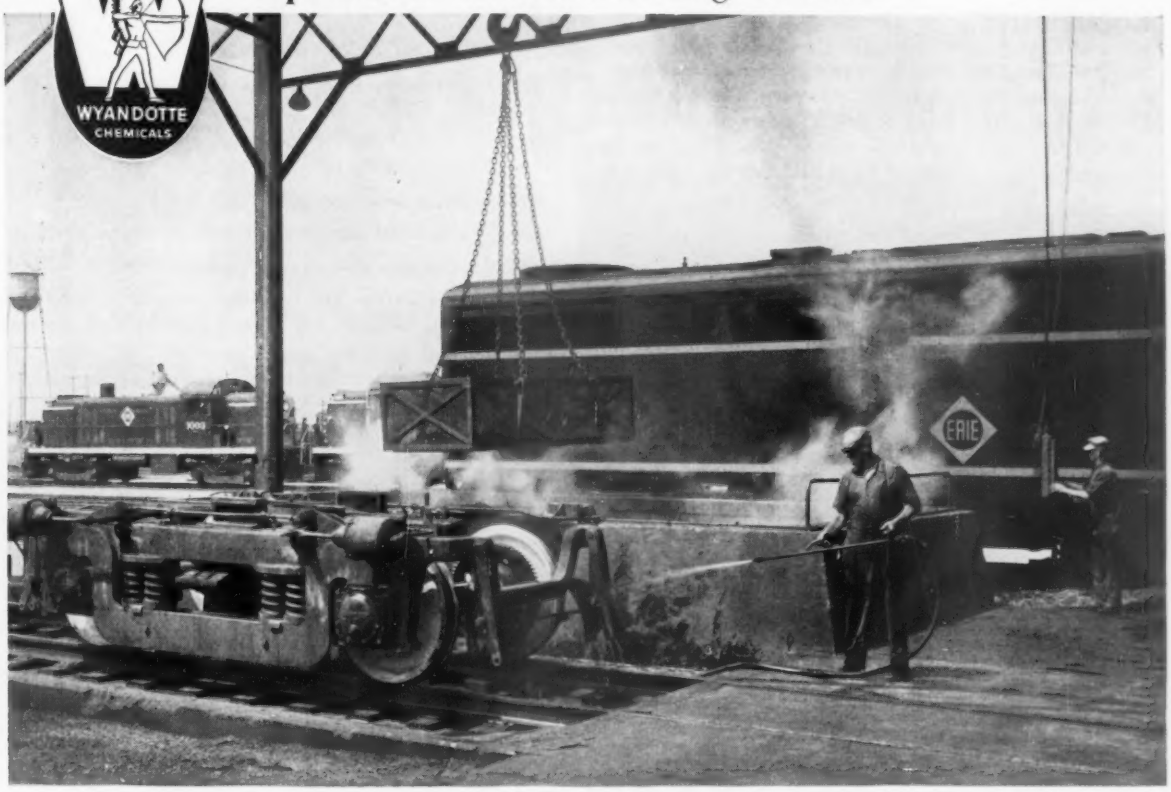
A.—Where one pair of wheels in unit type truck is changed account delivering line responsibility and dust guards for other pair of wheels in same truck are renewed at the same time account worn out, owners responsibility, material charge for renewal of such worn out dust guards may be made versus car owner.

52-Q.—In arriving at reproduction value for settlement of destroyed passenger cars, what consideration should be given to cost of betterments made to such cars?

A.—The capitalized portion of the cost of additions or betterments, applied subsequently to date passenger equipment car was originally built, should be adjusted per second note under P.C. Rule 18 and added to the similarly adjusted cost of the original car to arrive at total reproduction cost of the car as of date car was damaged. This total reproduction cost should be depreciated from date car was originally built, except, of course, in the case of the capitalized cost of air conditioning system applied subsequent to date car was originally built, which latter costs as prescribed in the Rule, should be depreciated from date of installation.

(Turn to page 80)

Specialists in Railroad Cleaning Products



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Diesel-Electric Locomotives*

961-Q.—What inspection is required after disassembly?
A.—Examine impeller shaft for wear or score marks. Remove any slight burrs or feather edges from the impeller. Examine the bearings and see that there are no damaged balls or chattered races and that the clearance between inward and outer races is not excessive.

962-Q.—Should the stainless steel shaft sleeve be removed?
A.—Not unless renewal is necessary.

MECHANICAL MAINTENANCE—WATER PUMP

963-Q.—What inspection of the bearings should be made?
A.—Examine the bearings and see that there are no damaged balls or chattered races. See that clearance between inner and outer races is not excessive. They should be thoroughly cleaned before re-applying, and lubricated with a light grease before assembly.

964-Q.—What attention should be given the impeller?
A.—Examine the impeller and remove any slight burrs or feather edges. Check fit of key in the impeller shaft and impeller. Renew water and oil seals as necessary.

965-Q.—How are the bearings of this pump lubricated?
A.—The bearings run in a bath of engine lubricating oil supplied from the free end gear spray nozzle. Oil enters the pump housing through a drilled passage from the top of the bearing support.

REASSEMBLY

966-Q.—What should first be done when reassembling?
A.—Press radial ball bearing and thrust ball bearing on the shaft. Apply thrust bearing lock washer and lock nut.

967-Q.—What should be done next?
A.—Press oil seal in pump housing. Position impeller shaft in pump housing. Place oil slinger in position at the pump end of shaft. Secure in position with set screws. Apply seal plate and fasten with nuts; wire in pairs.

968-Q.—What action should follow?
A.—Apply thrust bearing retainer at drive end of shaft. Apply capscrews and locking wire. Apply volute casing to pump housing and secure with self-locking nuts.

969-Q.—What precaution should be taken with the volute casing?
A.—Be sure that the casing is positioned correctly on pump housing.

970-Q.—What should be done next?
A.—Apply water impeller to shaft with key. Apply lock washer and lock nut to impeller shaft. Secure lock nut with cotter pin.

971-Q.—What should be done previous to installing pump on engine?
A.—Before installing, the bearing housing should be filled with clean engine lubricating oil through the inlet oil passage of the housing.

972-Q.—What assures positive alignment of the pump assembly?
A.—A boss on the back of the pump assembly.

LUBRICATING OIL CIRCULATING PUMP

973-Q.—Of what type is this pump and where is it mounted?
A.—A positive displacement type, and it is mounted on the free end casing.

974-Q.—How is this pump driven?
A.—By the diesel engine crankshaft extension gear.

975-Q.—Describe the assembly further.
A.—The oil suction line from the sump is built into the base and the free end casing, and lines up with the inlet passage cast into the pump housing. The pump discharges into external piping through a flange in the pump body.

REMOVAL

976-Q.—What is the procedure when removing the lubricating oil pump?
A.—Remove discharge pipe and any interfering piping. Apply chain hoist to eye bolt on top of pump housing and take up the slack.

977-Q.—What should follow?
A.—Remove capscrews on the back plate of pump and pull pump assembly directly forward until the male and female splines are disengaged. Further disassembly of the pump should be done at the bench.

DISASSEMBLY

978-Q.—Describe the initial phase of this operation.
A.—Remove the hex nuts from the front end of pump housing and remove the face plate by jacking it from the casing, using the two tapped holes provided in the plate.

979-Q.—What should be done next?
A.—Remove the outer idler gear wear plate stamped *No. 10.*

980-Q.—What should follow?
A.—Loosen the set screws in back of pump housing which anchor the idler gear shaft. Remove the shaft, gear and back wear plate stamped *No. 9.* As the idler gear rotates on the shaft, the gear may be easily slipped from the shaft.

981-Q.—What should be removed next?
A.—The drive shaft and gear.

982-Q.—How is the casing removed from the back plate?
A.—Unscrew the self-locking hex nuts and pull plate from casing.

INSPECTION AND MAINTENANCE

983-Q.—What routine should be followed for inspection?
A.—Carefully examine surface of gears. Slight burrs or feather edges may be removed with a fine hand stone. Examine the bearing.

984-Q.—How are the pump drive shaft bushings indentified?

(Continued on page 86)

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives. The figure numbers and references, by number, to diagrams, etc., relate to the current edition of the Alco-G.E. operating and maintenance manual.

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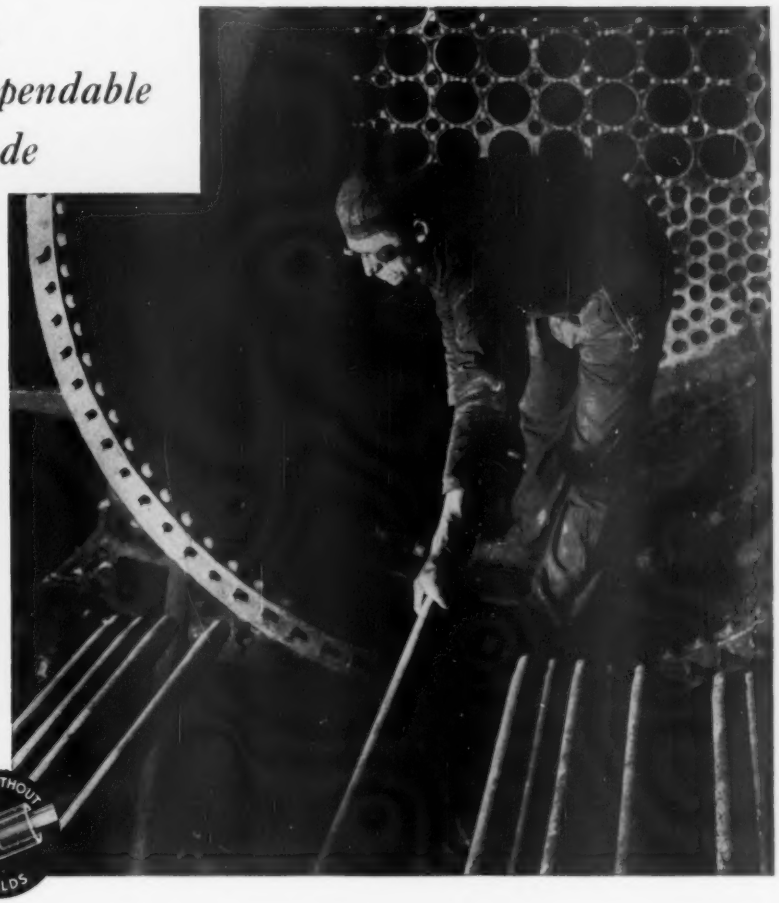

SECTIONS of NATIONAL Seamless Tubing being subjected to coupon manipulating tests to prove the uniformity of the physical qualities of the tube. Notice how crushed and flattened tubes have refused to split.

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Seamless tubes are first choice in boiler reconditioning because they possess the dimensional uniformity, high wall strength, and uniform density that are so necessary to withstand the intense pressures and high temperatures built up by present day steam locomotives.

In NATIONAL Seamless Boiler Tubes, the entire means of producing such dependable, uniform strength is concentrated in one fundamental operation—piercing a solid billet of steel. The piercing is both a manufacturing operation and a searching test of the character of the metal—the steel must be of the highest quality, of uniform composition, absolutely sound.

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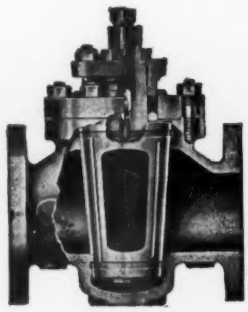

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Walworth
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Walworth
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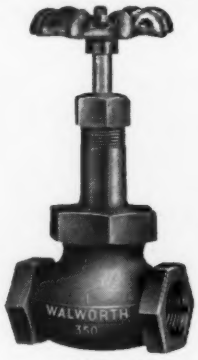

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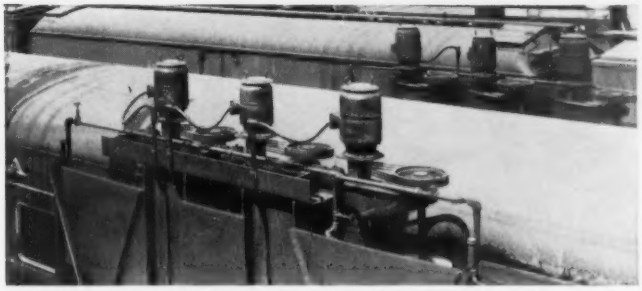

G-E 2-hp and 3-hp induction motors driving this Whiting car washer have run 112 hours a week for 8 years, giving dependable service.

Two hundred cars a day pass through the Whiting car washer in the Pennsylvania Railroad's Pittsburgh yard. The washer is equipped with G-E fan-cooled induction motors, which run 16 hours a day, 7 days a week. Yet, a once-a-year lubrication inspection is the only maintenance required.

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You can put your confidence in—

GENERAL ELECTRIC

(Continued from page 80)

A.—By a stamped number on the back of the flanges: *No. 4* for the back bushing and *No. 5* for the front bushing.

985-Q.—How are the pump idler gear plates identified?

A.—By a stamped number on the back of the flanges; *No. 9* for the back wear plate and *No. 10* for the front wear plate.

986-Q.—Are the pump casing faces (against which the above flanges are installed) identified in any way?

A.—Yes. They are also stamped with corresponding numbers of the bushing or the wear plate.

987-Q.—What is the reason for this set up?

A.—To provide means to assure installation of the bushings and wear plates so that the proper circulation of lubricating oil is established.

Schedule 24 RL
Air Brakes

1652-Q.—How is the current affected in the event that a jumper between cars becomes open at a position where the braking effort can be seriously impaired?

A.—The current in the common wire is reduced.

1653-Q.—What then happens?

A.—The voltage drop across the resistor is correspondingly reduced to a value low enough to cause relay *Q* to break the circuit.

1654-Q.—What action then takes place?

A.—The front contact of relay *Q* becomes open and relay *U* is de-energized.

1655-Q.—How does this affect the lights?

A.—The white light is extinguished and the red light becomes energized.

Operation

1656-Q.—What number of vehicles can be taken care of by the SC-2-A Circuit Checking Equipment?

A.—This equipment is so designed that it can check the integrity of the electro-pneumatic train line circuits in any train of from one to twenty-four vehicles.

1657-Q.—How is the number of vehicles determined?

A.—The total count of the vehicles in the sum of the power units and the number of cars.

1658-Q.—How are the power units considered in the count?

A.—Each unit is considered as one vehicle.

1659-Q.—What percent of the total resistance of the train line circuits can be detected?

A.—The equipment will detect any change of resistance, either an increase or decrease, of approximately 10 percent of the total resistance of the train line circuits.

1660-Q.—How long does this change of resistance exist before any indication?

A.—Should this change exist for more than approximately 5 seconds with the brakes released, the indication on the indicating light panel will change from white to red.

1661-Q.—What does this indicate to the engineman?

A.—That he should move his brake selector lever on the brake valve from electro-pneumatic to automatic position and proceed, using the automatic brake.

1662-Q.—What is the position of the electro-pneumatic brake if the indication on the indicating light panel does not change for five seconds?

A.—In Release.

1663-Q.—Does this also apply to Application position?

A.—No. When the electro-pneumatic brakes are applied the indication changes immediately.

1664-Q.—What happens immediately afterwards?

A.—A full service brake application will result at once.

1665-Q.—Can this brake application be forestalled or recaptured?

A.—No.

1666-Q.—What action takes place if the electro-pneumatic brakes are released and a circuit fault is indicated?

A.—A service application will occur should the engineman not notice or if he disregards the indication and attempts to use the electro-pneumatic brake.

1667-Q.—Referring to Fig. 1, describe the two rheostats on the front panel of the relay cabinet.

A.—The two rheostats are adjustable and their dials are numbered from 1 to 24 to correspond with the number of vehicles in the train.

1668-Q.—What is located near each rheostat knob?

A.—Near each rheostat knob is a milliameter which is used when initially balancing each circuit.

1669-Q.—Describe the lights mounted on the panel.

A.—Two lights are mounted on the panel, one white and one red, which are duplicates of those on the indicating light panel and give the same indications.

1670-Q.—What is the reason for this duplication of the lights?

A.—For convenience when adjusting the equipment.

1671-Q.—What other important items are on this panel?

A.—The *ON-OFF* power switch on the left and the three position or lever switch at the right.

Cutting in the Equipment

1672-Q.—What must be done when taking control of a train?

A.—An inspected electro-pneumatic brake application and release is made to insure that all brakes operate properly.

1673-Q.—What must be done prior to making this test, in order to prevent a full service application?

A.—The circuit checking equipment must be cut in.

1674-Q.—When this test is properly made and an automatic service application does not occur, what is the indication?

A.—This will indicate that the brake wiring is intact and functioning as intended.

1 5/8" TRAVEL

2 ½" TRAVEL

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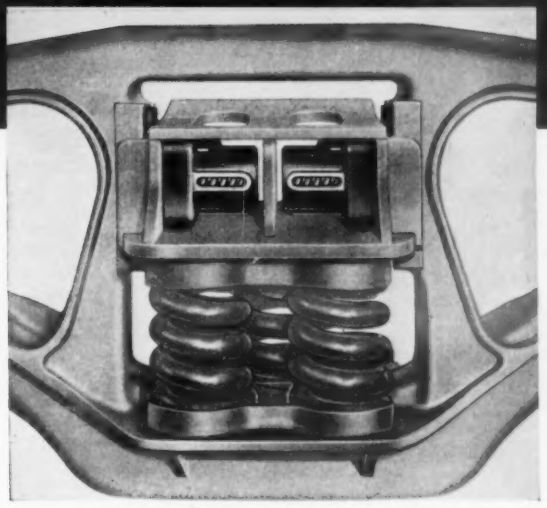

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Sonotone nickel-cadmium battery, 7.5-volt starting battery type (6-5H-10).

Sintered-Plate Nickel-Cadmium Battery

A nickel-cadmium storage battery of a sintered-plate type which has been in military service for the past four years is now being made available for general applications by the Battery Division of the Sonotone Corporation, Elmsford, N. Y. The sintering or heat-fusing used to form the plates deposits the plate metals in microscopic pores and produces plates having very large working surface areas. At the same time the plates have smooth surfaces which permits their being packed together with only thin separators. The electrolyte is potassium hydroxide.

The result is a battery which has low internal resistance making it suitable for engine starting and at the same time allowing it to be cycled, (completely discharged and recharged), indefinitely without appreciable loss of life or capacity. Ability to cycle is a must for passenger car air conditioning service.

The manufacturer states that it is less than half the size of other batteries, of equivalent capacity, that is not subject to damage by shock or vibration, that it is not injured by overcharging, reverse charging or short circuiting, that it requires very little flushing, that it will operate at temperatures between minus 65 and plus 165 deg. F. and that it may be charged and discharged at very high rates. Tests indicate the battery should have a life of 20 years. The cost of the battery will probably be from two to five times the cost of a lead-acid battery of the same capacity.

■

Alkaline Cleaning Compound

A new material for washing railroad equipment such as interiors and exteriors of locomotives, tenders, head end cars and railroad trucks has been announced by Oakite Products, Inc., 19 Rector st., New York 6. It is known as Composition No. 72.

The formulation is a mild alkaline cleaner that dissolves readily in hot or cold water, and rinses freely. It is recommended for use at between 2 to 6 oz. per gallon of water and it may be heated to 145 deg. F. It is not recommended for cleaning varnished surfaces.

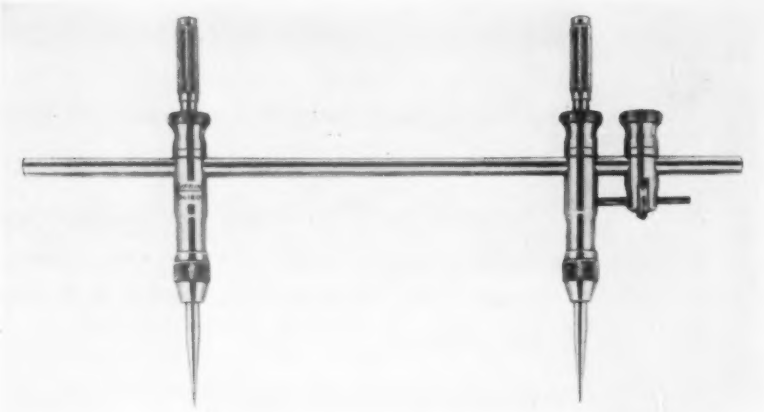
■

Portable Electric Jack

The Whiting Corporation, Harvey, Ill., has developed a new Model-MA 35-ton portable electric jack of rugged construction, well balanced, with large rubber-tired wheels, anti-friction bearings and hence easily moved by one man. The two main wheels are 20 in. and the single steering wheels 12 in. in diameter. Four of these jacks are effectively used in raising and supporting diesel locomotive or passenger-car bodies while trucks are being changed. The wheels are retracted while jacking and the jack base stands firmly on the floor.

Each jack is equipped with individual push button control, making it easy for the operator to run the lifting bracket up against the locomotive jacking pad. With all jacks in working position, the operator can then control the hoisting and lowering of the complete set of four jacks by means of a pendant master push button which may be plugged into either jack No. 1 or No. 4. Since the master push button

(*Continued on page 90*)



Steel Beam Trammels

This tram, designed by The Lufkin Rule Company, Saginaw, Mich., is an easy-to-use tool for layout work, scribing and measuring, according to its manufacturer. Free-turning knurled grips, on the top of each unit, make it convenient to use. Spring friction prevents the device from sliding off its beam when the clamping nuts are loosened.

Designated the No. 180 series, the trammel beams are manufactured in 10½, 14½ and 20 in. lengths.

With a 20 in. extension beam, it can scribe circles up to 72 in. in diameter. They are equipped with fine thread adjusting screws to give accurate adjustment. They are available with hardened points, needle points, pen attachments, steel point and lead holding chuck and ballpoint attachments.

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

WESTERN UNION

FX-1201

W. P. MARSHALL, PRESIDENT

SYMBOLS

DL = Day Letter
NL = Night Letter
LT = Int'l Letter Telegram
VLT = Int'l Victory Ltr.

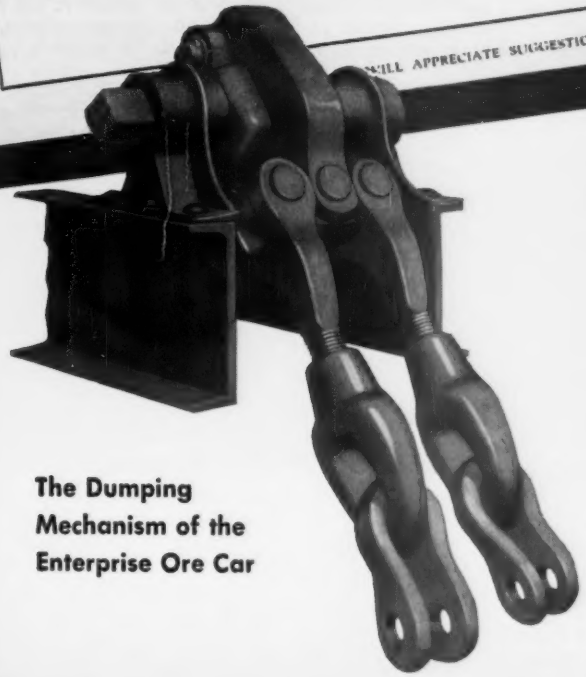
The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

MR RAILROAD EXECUTIVE

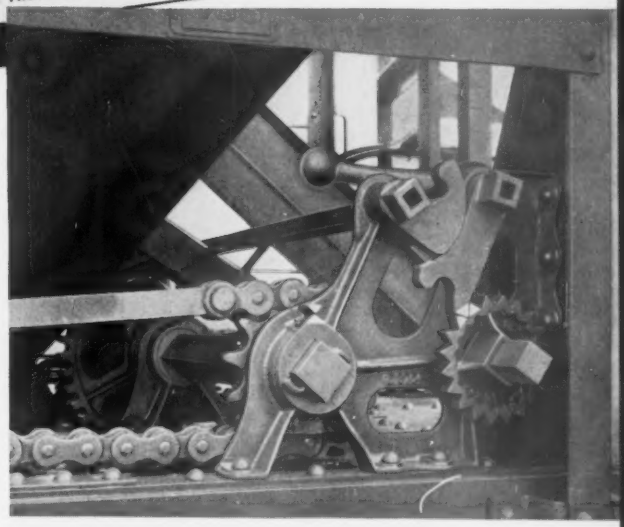
OVER NINETY PER CENT OF ALL ORE CARS BUILT IN THE LAST TWENTY FIVE YEARS HAVE BEEN ENTERPRISE EQUIPPED ORE CARS THE RUGGED ENTERPRISE MECHANISM WILL LAST THE LIFE OF THE CAR FAST EASY AND SAFE TO OPERATE IDEAL FOR POWER TRIPPING

ENTERPRISE RAILWAY EQUIPMENT COMPANY

WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE



The Dumping Mechanism of the Enterprise Ore Car



Enterprise Door Latch and Operating Mechanism (Operates from either side of car)

4459 S

Door Operating Devices Exclusively Since 1905

ENTERPRISE RAILWAY EQUIPMENT COMPANY

59 East Van Buren Street • Chicago 5, Illinois

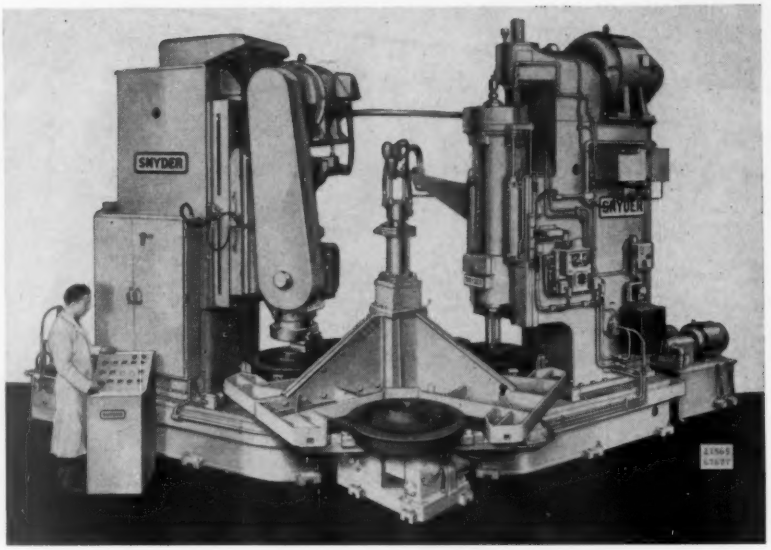
NEW DEVICES

(*Continued from page 88*)

is equipped with 25 ft. of rubber covered control cable, the operator may walk about and stand close to the working point while still having complete control of the jack movement.

The new Whiting jack has a lift of 4 ft. 7 in., with 3 15/16-in. diameter square-thread screw protected against dust and dirt by a new accordion-type flexible cover. Power is supplied to the lifting screw from a 7½-hp. electric motor and an electric brake assures instant stopping when the power is shut off. Dangerous drifting of the jacks either up or down is thus prevented and the locomotive is supported in a safe level position at all times. The electric drive also assures exceptionally smooth and quiet operation.

■



Boring and Facing Machine

Two operations, boring and facing hubs, are combined with this unit, thus cutting down the amount of handling required to process heavy cast iron railroad car wheels.

The machine, introduced by Snyder Tool and Engineering Company, 3400 E. Lafayette, Detroit 7, has three major components: a vertical spindle column for the facing operation, a boring head and an indexing turntable with three work-holding positions, 120 deg. apart. These components are mounted on a rigidly braced welded steel base.

Four carbide tips, two round for roughing and two square for finishing are used on the boring bar and permits roughing and finishing work to be performed simultaneously. The indexing system with its three work-holding positions, rotates three times during the machining cycle.

The machine is controlled through a remote panel. In normal operation, the operator pushes a cycle-start button which automatically sets up the machining cycle including indexing, clamping, cutting, unclamping and transferring the part to the next work position.

The unit cycles 33 times per hr., has a speed of 260 surface ft. per min., and a feed of 0.045 in. per revolution. Necessary floor space is 300 by 200 in.

Battery Water By Ion-Exchange

Ordinary tap water can be stripped of its mineral impurities and converted to the chemical purity of high quality distilled water by a simple passage of the raw water through the Hydrion units, made by the A. E. Tomkin Company, 1507 M street, N. W., Washington 5, D. C. No heat or power is required. The Hydrions operate by continuous flow directly off the water source. By direct attachement to any water faucet pure battery water is available at all locations when wanted.

The Hydrions utilize in their operation the ion-exchange principle to effect the removal of dissolved ionized minerals from water. Using a disposable refill charge, pure water is produced. Exhausted refill charges are readily discarded, and the unit is quickly loaded with a fresh charge. An electronic purity indicator built into the head of the unit shows the exact purity of the delivered water at all timese. While in operation, the Hydrions require practically no attention since the indicator dial gives ample advanced notice before exhaustion of a refill charge.

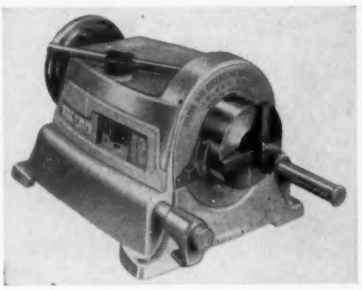
The de-mineralized water is suitable for both acid and alkaline storage batteries. The detrimental impurities present in natural waters such as chlorides, nitrates and iron are removed as well as other mineral impurities found in tap water.

The hydrions of the C51B type are available in two model sizes. Model C51B-S is the standard size rated at a flow capacity of five gal. per hr. This model is intended for light duty service. The heavy duty model C51B-H is designed for shop, yard and terminal work and is rated at a flow capacity of 10 gal. per hr. Both models produce water of the same degree of purity.

■

Pipe Tool Power Drive

This unit is said to convert hand tools to power in the shop or on the job anywhere. Designated Toledo 88 Power Drive, it was designed by the Toledo Pipe Threading Machine Company, Toledo, Ohio, for operation of hand pipe threaders, cutters and reamers.



Its aluminum housing results in weight reduction to 140 lb., and increases ease of portability. Capacity on pipes is ⅛ to 2 in. and ¼ to 1½ in. on bolts; with universal drive shaft, geared die stocks and cutters up to 12 in.

The device features a red and gray finish, 3-jaw scroll chuck with 6 pinions, universal ½-hp. motor for operation on 25 to 60 cycle a.c. or d.c., 110 volts. Occasional lubrication is required for the bronze bushings on the spindle, and spindle gear and drive pinion. The tool can be mounted on a bench or service truck or furnished with legs and tool tray as accessories.

(*Turn to page 92*)

THE ENGINEER'S REPORT

DATA

LUBRICANT Calol Rail + Flange Lubricant

LUBRICATOR Mechanical

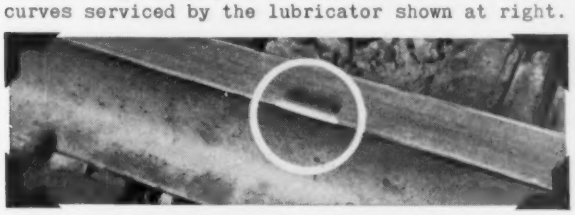
LOCATION California + Oregon

CONDITIONS Ambient temp. -20° F. to 110° F. Continuous use

TEST PERIOD 10 months

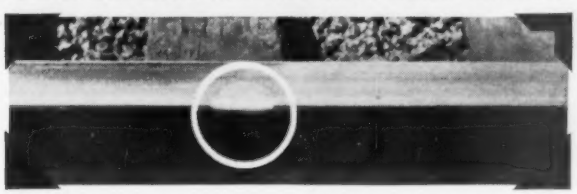
New rail-flange lubricant meets toughest conditions!

CALOL RAIL AND FLANGE LUBRICANT, tested continuously for 10 months at six locations on a major western railroad, proved entirely satisfactory. Although air temperatures ranged from 20 below zero to 110 above, the lubricant retained correct consistency for good pumpability both in storage and lubricators. Grease buttons on wiping bars remained in position even in direct sunlight. Coverage was excellent, as demonstrated by photographs below of rails at successive curves serviced by the lubricator shown at right.



FILM OF CALOL RAIL & FLANGE LUBRICANT at first curve. Circled area is wiped clean for contrast.

FILM OF LUBRICANT on second curve from lubricator.



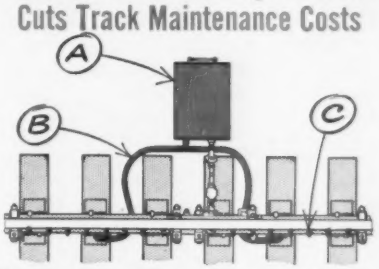
THIRD CURVE. Note grease is still well distributed.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How Calol Rail and Flange Lubricant Cuts Track Maintenance Costs



A. Stable in use and storage—will not separate, "bleed" or harden.

B. Pumps freely from lubricators from below zero temperatures to over 100 degrees. Retains even consistency.

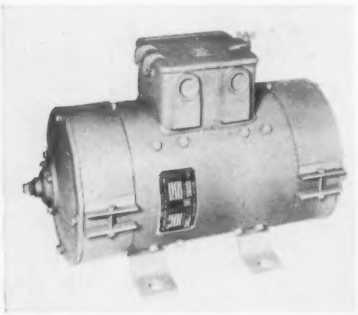
C. Forms stable buttons which resist high temperatures. Very adhesive — carries for long distance on rails. Resists tendency to pull over tops of rails.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco 20
THE CALIFORNIA OIL COMPANY • Barber, New Jersey
STANDARD OIL COMPANY OF TEXAS • El Paso
THE CALIFORNIA COMPANY • Denver 1, Colorado

NEW DEVICES

(Continued from page 90)



M.G. Set for Radio Power Supply

The Safety Car Heating and Lighting Company, Inc., New Haven, Conn., announces a new conversion unit, called the Safety B-1042-2 Motor Generator set for 64 volts input to 12 volts output.

Designed as a power source for 12-volt d.c. radio equipment, the new m.g. set is rated at 300 watts output. It has inherent voltage and speed regulation and can be started directly across the line. The regulation has no moving parts and automatically compensates for input voltage variations from 56 to 80 volts, for load fluctuations between no load and full load, and for temperature changes. Its totally enclosed construction permits it to be mounted on the exterior of a locomotive.

■

Gear and Wheel Puller

These gear and wheel pullers have been made available for maintenance of industrial machinery, trucks and right-of-way equipment. Made by J. H. Williams & Co., 400 Vulcan street, Buffalo 7, N. Y., they are fabricated in two and three jaw styles, in many sizes.

Jaws and blocks are forged from steel, heat-treated for extra strength and the forcing screws are made of alloy steel. The jaw clips are self adjusting. Several styles are equipped with many attachments making it possible to assemble the right puller for the particular job.

■

Rate-of-Rise Relay

When a short circuit occurs in the traction-motor circui of a diesel-elecric locomotive a race begins. The current from the main generator begins to rise at a terrific rate. —approximately 500,000 amp. per sec. If this current rise is allowed to contninue unchecked, the commutator flashes over, often causing extensive damage to the generator. The race is between the rapidly rising current and the protective relay (impulse relay) that senses the current rise and acts to remove excitation from the generator field either before flashover or so quickly thereafter that extensive damage is prevented. The relay designed by Westinghouse to do this and the contactor associated with it are new in combination, but old as components. They act so quickly that the total time from start of the current rise to extinction of contactor arc is 1/40 of a second.

Laboratory tests show that the relay provides excellent protection to a generator. When the generator was short circuited repeatedly at its maximum voltage, the resulting flashes caused minor and superficial damage to brushholders and the ends of the commutator bars. Without the relay one short circuit and resulting flash under similar conditions caused sufficient damage to require extensive cleaning of the brushholders and commutator bars and replacement of the string band and some brushholder insulators.

■

Sandwich-Type Panels

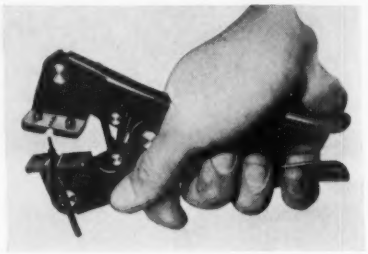
Panels, consisting of two outer sheets of embossed aluminum bonded with heat and pressure to a core made with resin-impregnated paper formed into a figure-eight honeycomb construction, have been made available by Reynolds Metals Company, 2500 S. Third st., Louisville, Ky.

The manufacturer claims that the panels have excellent thermal and acoustical insulation qualities, are light in weight and have sufficient mechanical strength to be self-supporting for such applications as doors, catwalks, platforms, refrigerator cars, etc.

Marketed under the name Reynocell, the product is available in thicknesses ranging from 1 to 4 in. and in sizes up to 57 in. by 16 ft. A 1 in. panel weighs only 1.01 lb. per sq. ft.; the 2 in. panel weighs 1.16 lb.; the 3 in. panel 1.31 lb.; and the 4 in. panel 1.46 lb. per sq. ft.

These aluminum panels are normally furnished in a natural finish, but surface treatments such as lacquering, enameling, plain and color anodizing can be applied.

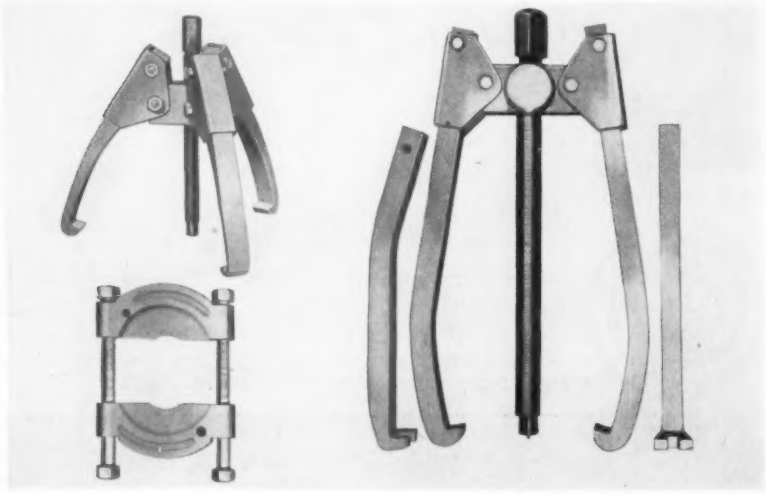
■

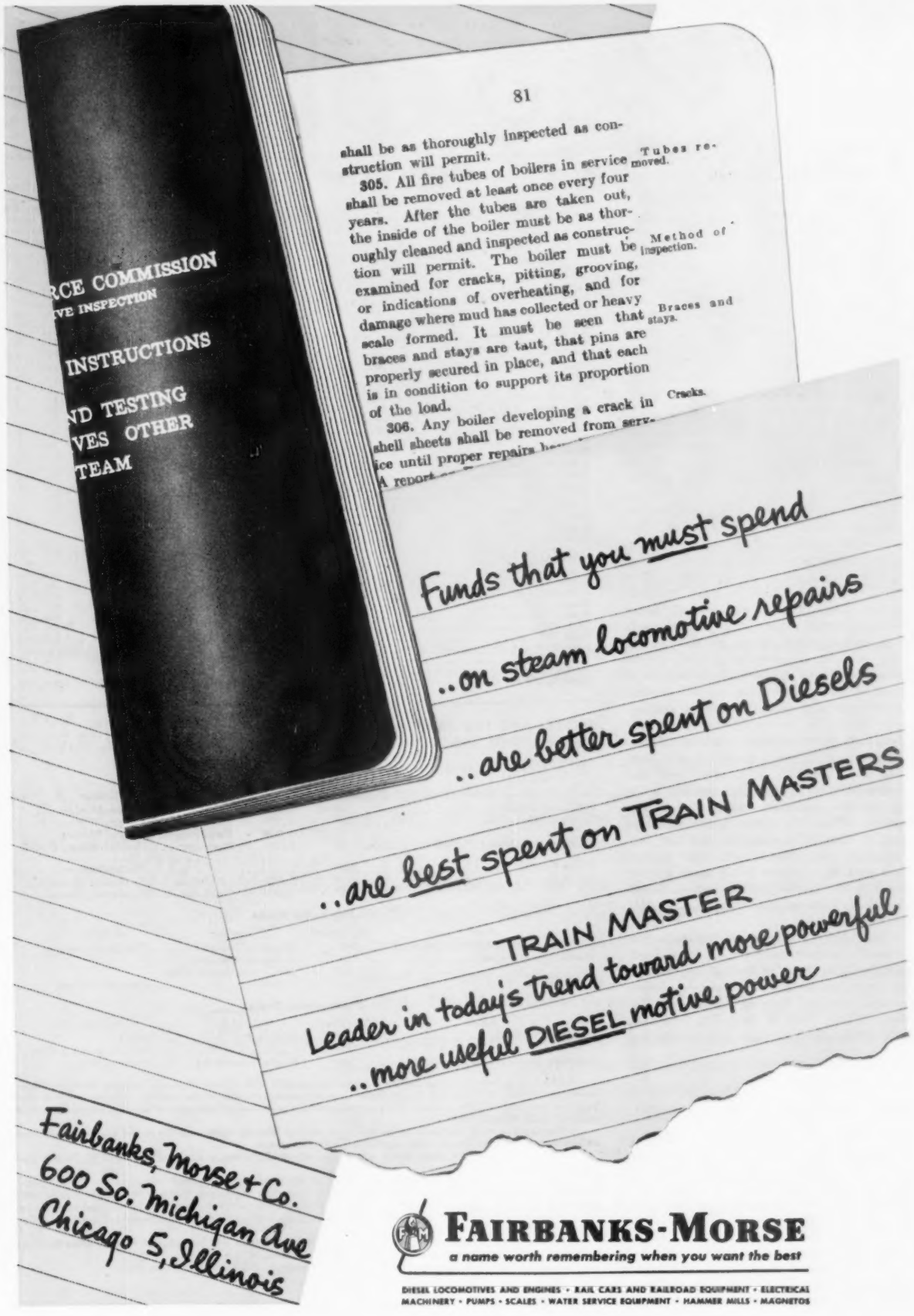


Improved Wire Stripping Tool

The Rockford Wire Stripper Company, Rockford, Ill., announces an improved wire stripper with interchangeable cutters for stripping 12- to 24-gage solid or stranded wire, or 300-ohm twin lead-in wire. The new model is being marketed under the trade name Whiz Wire Stripper. It is light in weight, with a lock-open feature that holds the jaws open automatically so the wire can be removed after stripping without crushing. The jaws are released with a finger tip touch of the lower handle, making it unnecessary to shift the grip on the tool while resetting. The weight of the tool is 12 ounces.

(Turn to page 108)




RCE COMMISSION
VE INSPECTION
INSTRUCTIONS
ND TESTING
VES OTHER
TEAM
81
shall be as thoroughly inspected as construction will permit.
Tubes removed.
305. All fire tubes of boilers in service shall be removed at least once every four years. After the tubes are taken out, the inside of the boiler must be as thoroughly cleaned and inspected as construction will permit. The boiler must be examined for cracks, pitting, grooving, or indications of overheating, and for damage where mud has collected or heavy scale formed. It must be seen that braces and stays are taut, that pins are properly secured in place, and that each is in condition to support its proportion of the load.
Method of inspection.
Braces and stays.
306. Any boiler developing a crack in shell sheets shall be removed from service until proper repairs
Cracks.
Funds that you must spend
..on steam locomotive repairs
..are better spent on Diesels
..are best spent on TRAIN MASTERS
TRAIN MASTER
Leader in today's trend toward more powerful
..more useful DIESEL motive power
Fairbanks, Morse & Co.
600 So. Michigan Ave
Chicago 5, Illinois

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL LOCOMOTIVES AND ENGINES • RAIL CARS AND RAILROAD EQUIPMENT • ELECTRICAL MACHINERY • PUMPS • SCALES • WATER SERVICE EQUIPMENT • HAMMER MILLS • MAGNETOS

NEWS

Servicing Journal Boxes With Special Lubricators

In connection with the various journal box lubricating devices using plain car oil as the lubricant and approved in limited number for general interchange freight service, the A.A.R. Mechanical Division reports some instances of cars found with regular journal box packing stuffed into the journal boxes on top of the lubricating devices, thereby preventing their proper operation as well as damaging them in some instances. It could not be determined whether these instances were due to oversight or carelessness on the part of men servicing journal boxes, or for other reasons. One version of the reason for stuffing journal box packing in journal boxes on top of such devices is that possibly the boxes may have been discovered just before train departure with little or no oil and fearing the cars might not run to the next station wih lack of oil and having no oil readily available for replacement this emergency means was taken.

While most roads at the present time have free oil available in main transportation yards for oiling journal boxes equipped with conventional journal packing, this may not always be the case. It is a question, therefore, as to what will be required if and when various designs of journal lubricators using car oil become more generally used. Obviously, employees should be instructed in the proper handling of cars equipped with lubricating devices and in no instance should journal box packing be stuffed into the journal box on top of a device which is not in proper operating condition for any reason. Where the device is not functioning, it should be removed and the box repacked with conventional type journal box packing, a report being made as outlined in the various circular letters, issued by Fred Peronto, secretary, A.A.R. Mechanical Division.

The following lubricating devices in the general category referred to have been approved to date for limited application to cars which move in general interchange service: Empire, Hennessy, Jeffers, Miller, Sockell Snug-Fit, Uni-Pak, McLeod packing retainer and lubricating pad.

Electrics Out at Detroit

Electric locomotives which have hauled freight and passenger trains between Detroit, Mich., and Windsor, Ont., through the Michigan Central's river tunnels for almost 44 years have been retired, and through operation by diesel power has been made 100 per cent effective in the tunnel and accessory yards.

Made possible by installation of a ventilating system sufficiently powerful to clear diesel exhaust from the 8,368-ft., two-tube

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
July, 1950	2,745,932,894	.....	.....	23,957	114,619
August, 1950	2,937,455,020	7,422	15,490	22,912	128,206
September, 1950	2,974,297,739	6,541	12,881	19,422	153,141
October, 1950	3,165,997,915	4,343	8,935	13,278	238,439
November, 1950	2,868,871,913	2,536	5,331	7,867	364,672
December, 1950	2,813,042,212	2,278	5,968	8,246	341,140
January, 1951	2,840,847,511	2,870	8,436	11,306	251,269
February, 1951	2,425,226,454	4,528	14,063	18,591	130,452
March, 1951	3,063,173,942	3,667	10,078	13,745	222,857
April, 1951	2,996,562,763	3,702	8,914	12,616	237,521
May, 1951	3,013,634,782	5,631	13,737	19,368	155,599
June, 1951	2,874,873,495	7,074	15,376	22,450	128,057
July, 1951	2,768,920,095	8,886	18,823	27,709	99,929
August, 1951	3,009,371,111	9,023	19,092	28,115	107,038
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477
March, 1952	2,943,812,727	2,594	5,877	8,471	347,517
April, 1952	2,766,313,714	3,826	7,759	11,585	238,784
May, 1952	2,918,508,445	6,020	10,938	16,958	172,102
June, 1952	2,672,512,889	8,466	14,495	22,961	116,394
July, 1952	2,575,298,912	10,566	15,833	26,399	97,553
August, 1952	2,924,917,122	11,658	17,535	29,193	100,192
September, 1952	2,931,129,734	7,536	13,608	21,144	138,627
October, 1952	3,093,990,289	4,058	8,053	12,111	255,469
November, 1952	2,984,101,808	2,198	4,501	6,699	445,455
December, 1952	2,869,928,617	1,742	3,632	5,374	534,040
January, 1953	2,828,906,282	2,219	4,123	6,342	446,059
February, 1953	2,625,563,462	2,111	4,059	6,170	425,537
March, 1953	2,904,227,804	2,696	6,077	8,769	331,192
April, 1953	2,850,752,648	3,383	6,435	9,818	290,359
May, 1953	3,013,610,843	5,892	11,433	17,325	173,945
June, 1953	2,672,512,889	8,466	14,495	23,833	116,394
July, 1953	2,925,317,024	9,342	15,775	25,117	116,467
August, 1953	2,971,020,484	8,638	14,160	22,798	130,319
September, 1953	2,822,222,832	6,083	10,195	16,278	173,376
October, 1953	3,042,558,922	3,863	6,493	10,356	293,796

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JANUARY ISSUE

Diesel-Electric Locomotive Orders

Road	No. of units	Horsepower	Service	Builder
Baltimore & Ohio	6[1]	1,200	Switch	Electro-Motive
Great Northern	31[2]	1,750	Road switch	Electro-Motive
	6 "B"	1,750	Road freight	Electro-Motive
Toronto, Hamilton & Buffalo	3[3]	1,750	Passenger	General Motors Diesel Ltd.
Union Pacific	205[4]	.....	.....	Electro-Motive
Virginian	19[5]	2,400	All-purpose	Fairbanks, Morse
	5[5]	1,600	Road switch	Fairbanks, Morse

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Burlington Refrigerator Express Co.	200[6]	50-ton refrigerator	Company shops
Western Fruit Express	250[7]	50-ton refrigerator	
	50[7]	70-ton all-purpose refrigerator	Company shops

Passenger-Car Orders

Road	No. of cars	Type of car	Builder
Canadian National	1	RDC-3	Budd
	57[7]	Coaches	Canadian Car & Fdry.
Canadian Pacific	18	Baggage-dormitory	Budd

[1] The new switchers, scheduled for delivery last month, will replace all steam locomotives in switching service at Keyser, W. Va., and Piqua, Ohio. Seventy-seven per cent of the road's freight service will then be diesel-powered, and 70 per cent of its passenger-train miles and 67 per cent of its yard switching will be operated with diesels.

[2] Twenty-five road switchers to be delivered during March, April and May; the remaining six road switchers and the road freight units are for delivery this month.

[3] With the delivery of these units, which was expected February 1, the TH&B will be 75 per cent dieselized.

[4] Delivery, expected to be complete by June of this year, will completely dieselize the UP's through main-line services from Omaha to the Pacific Coast, except to the extent that gas turbine-electric locomotives may be used. Approximately 40 units were scheduled to be on the property by the end of January. All the freight units are 1,750-hp. GP-9 general purpose locomotives; the passenger units are 2,400-hp. E-9—five "A" (cab) type and 10 "B" type.

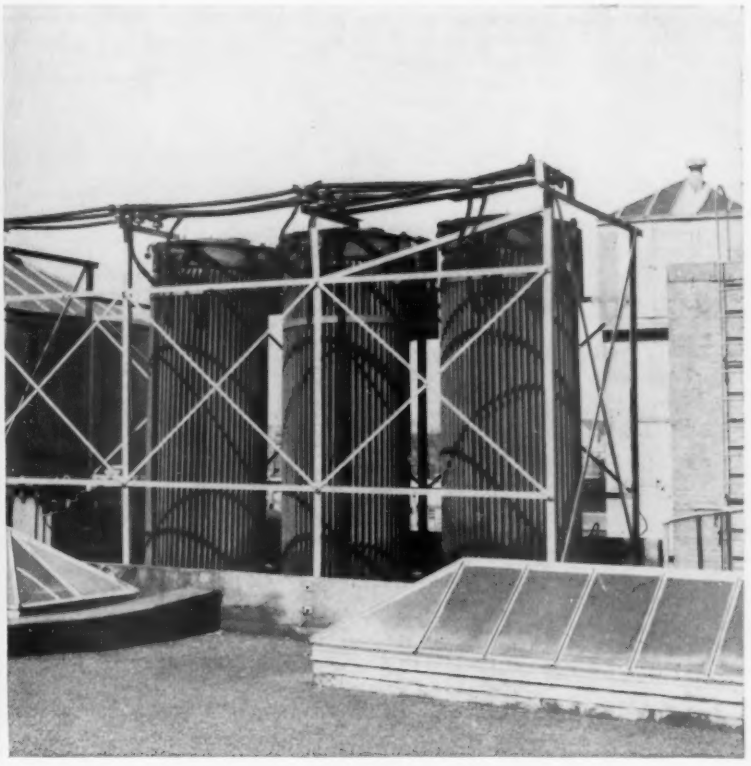
[5] The 2,400-hp. Trainmaster units and the six road-switchers will be assigned to coal mine territory and other heavy transportation work at, and west of, Elmore, W. Va.

[6] To be equipped with meat rails. Production to begin in third quarter of this year.

[7] Production to begin in third quarter of this year.

[7] Cost, $7,486,000.

So Much Depends Upon So Little



Make a quick guess, and figure how much money it would cost if the high voltage power distribution system in your repair shops failed. Quite a sizable amount, isn't it?

That's what we mean by "so much depends upon so little." Sure, comparatively speaking, power cable is only a small part of the total cost of the plant. But when a cable failure occurs, the price of the shutdown can far exceed what you'd pay for dependable Simplex-ANHYDREX XX High Voltage Feeder Cable.

Why gamble with power cable cost? For practically the same price as ordinary cable, Simplex-ANHYDREX XX Cable provides you with:

- √ Exceptional resistance to: Heat — Aging — Ozone — Oxidation.
- √ Added to these advantages, NO Simplex-ANHYDREX Cable HAS EVER FAILED due to water absorption.

Because "so much depends upon so little," specify Simplex-ANHYDREX XX Cables for the high voltage power distribution system in your roundhouses, diesel shops, car rebuilding shops, etc. You can depend on Simplex-ANHYDREX XX Cables.

Simplex WIRES & CABLES

SIMPLEX WIRE & CABLE CO.

79 SIDNEY STREET, CAMBRIDGE 39, MASSACHUSETTS

subaqueous tunnel, the cessation of straight electric propulsion brings to an end one of the early trunk-line electrification projects designed to provide power in physical circumstances where steam operation is undesirable. Through operation of diesel power will eliminate the previous necessity of changing power at Windsor. Detroit is a division point.

The original 100- and 120-ton electric locomotives put in service in 1910 have since been supplemented by modified locomotives transferred from the Electric division of the New York Central at New York and from the Cleveland Union Terminal (on which the last straight electric ran last November). Length of the electrified section was about 4.5 miles, with about 28 miles of track equipped with third rail (or overhead steel contacts at interlockings).

Trade Publications

LOCKNUTS. Security Locknut Corporation, 1500 North avenue, Melrose Park, Ill. Eight-page, two-color illustrated folder describes Security line of Locknuts; gives specifications, and shows applications as case histories.

■

CHERRY BLIND RIVETS. Townsend Company, New Brighton, Pa. 12-page, two-color Catalog TL-76 illustrates and describes in detail Cherry blind rivets and rivet guns. Includes application data, mechanical specifications, and a list of available stock blind rivets.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of September 1953	Month of September 1952	9 months ended with September 1953	9 months ended with September 1952
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	11,760	17,165	111,980	154,781
3-06	Total, Diesel-electric	31,213	28,301	279,369	242,083
3-07	Total, electric	697	763	6,572	6,799
3-04	Total, locomotive-miles	43,756	46,289	398,515	403,935
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,650	1,748	14,982	14,662
4-06	Empty, total	904	882	8,213	7,976
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	22,140	31,482	202,558	273,987
6-02	Total in oil-burning steam locomotive trains	5,617	8,943	54,160	74,469
6-03	Total in Diesel-electric locomotive trains	87,389	80,691	781,681	671,493
6-04	Total in electric locomotive trains	1,977	2,072	18,599	18,862
6-06	Total in all trains	117,402	123,389	1,058,960	1,039,795
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.04	1.03	1.03
10-02	Loaded freight car-miles	40.80	41.50	40.80	39.80
10-03	Empty freight car-miles	22.40	20.90	22.30	21.60
10-04	Total freight car-miles (excluding caboose)	63.20	62.40	63.10	61.40
10-05	Gross ton-miles (excluding locomotive and tender)	2,903	2,927	2,881	2,819
10-06	Net ton-miles	1,336	1,381	1,311	1,298
12	Net ton-miles per loaded car-mile (M-211)	32.80	33.30	32.20	32.70
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.60	66.50	64.60	64.80
14	Averages per train hour (M-211):				
14-01	Train miles	18.00	17.30	18.20	17.60
14-02	Gross ton-miles (excluding locomotive and tender)	51,585	49,844	51,725	48,934
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	45.80	47.00	45.70	44.60
14-02	All	43.50	44.60	43.50	42.30
15	Average net ton-miles per freight car-day (M-240)	921	986	904	895
17	Per cent of home cars of total freight cars on the line (M-240)	44.50	39.70	46.20	43.70

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	3,444	5,750	39,270	62,352
3-06	Diesel-electric	20,055	18,754	181,075	166,821
3-07	Electric	1,451	1,562	13,803	14,603
3-04	Total	24,950	26,066	234,149	243,784
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	252,603	260,094	2,366,100	2,432,291
4-09	Total in coal-burning steam locomotive trains	17,690	29,807	219,909	321,131
4-10	Total in oil-burning steam locomotive trains	13,130	22,577	135,424	229,724
4-11	Total in Diesel-electric locomotive trains	205,641	190,462	1,857,650	1,719,909
12	Total car-miles per train-miles	9.75	9.71	9.79	9.76

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	576	780	5,381	7,241
1-02	Steam, oil-burning	94	167	979	1,489
1-03	Diesel-electric[1]	3,441	3,268	30,905	28,026
1-06	Total	4,128	4,240	37,445	36,968
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	17	23	183	251
2-02	Steam-oil-burning	6	10	59	97
2-03	Diesel-electric[1]	250	249	2,302	2,295
2-06	Total	307	314	2,834	2,942
3	Hours per yard locomotive-day:				
3-01	Steam	7.20	7.50	6.80	6.90
3-02	Diesel-electric	16.20	16.50	16.30	16.10
3-05	Serviceable	15.10	14.90	14.90	14.20
3-06	All locomotives (serviceable, unserviceable and stored)	13.50	13.00	13.20	12.30
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.74	1.69	1.73	1.75
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.75	0.75	0.74	0.75

[1]Excludes B and trailing A units.

SUPPLY TRADE NOTES

H. K. PORTER COMPANY.—*J. M. Tough* has been appointed sales manager of the *Watson-Stillman Fittings division*, Porter

J. M. Tough

Company, with responsibility for all sales activities. Mr. Tough was previously Chicago district manager.

WEST DISINFECTING COMPANY.—The railroad department is expanding its sanitation, maintenance and employee hygiene services for southern railroads, and has appointed *William R. Rodgers* as district specialist, at Richmond, Va.

■

EBCO MANUFACTURING COMPANY.—*John M. Harris* and *William O. Corfield* have been appointed district sales managers, in charge of Oasis and Kelvinator water cooler and air drier sales in midwestern states.

■

RIDGE TOOL COMPANY.—*C. O. Hollen*, sales representative in eastern states since 1925, has retired. *Ralph W. Hamilin* succeeds Mr. Hollen in New Jersey, Pennsylvania east of Lewistown, and Wilmington, Del. *M. B. Williams* takes over pipe tools sales in the District of Columbia, Maryland, Delaware (except Wilmington), Virginia, and North Carolina.

REPUBLIC STEEL CORPORATION.—*Clyde E. Roberts*, assistant manager of sales, Alloy Steel division, has been appointed manager of sales for that division, at Massillon, Ohio, succeeding *Martin H. Schmid*, retired.

■

JOSEPH T. RYERSON & SON, INC.—Ryerson has moved from its former location in Milwaukee to a new plant at 500 South 88th street, which has approximately 170,000 sq. ft. of floor space and four times the capacity of the old plant.

■

ELECTRIC STORAGE BATTERY COMPANY.—*C. J. Moore*, manager of railway and motive power sales, has been appointed industrial products sales manager. *L. E. Wells*, chief engineer, has become director of research and engineering, industrial products. *John W. Kelly*, formerly a sales engineer at Atlanta, Ga., has been appointed manager of the branch office at 100 Ashford street, Boston. Mr. Kelly

STABILIZATION · DISPERSION

FOR SUCCESSFUL USE OF LOWER COST DIESEL FUEL OILS

with *Nalco* SR-158D

- CUTS FUEL COSTS
- IMPROVES FUEL EFFICIENCY
- LOWERS MAINTENANCE
  - of LOCOMOTIVES
  - of STORAGE and FUELING FACILITIES

Nalco's series of Fuel Oil Treatments are enabling railroads to successfully use fuel oils that, untreated, would cause serious difficulties in both storage systems and locomotives.

Fuel oil cost savings achieved with Nalco Treatments are only part of the picture: better fuel combustion; sludge-free tanks, valves, pipes and injectors add further savings in maintenance and increase over-all operating efficiency.

Full details on Nalco Fuel Oil Treatments will be sent promptly upon request. Call your Nalco Representative, or write direct.

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6190 West 66th Place • Chicago 38, Illinois
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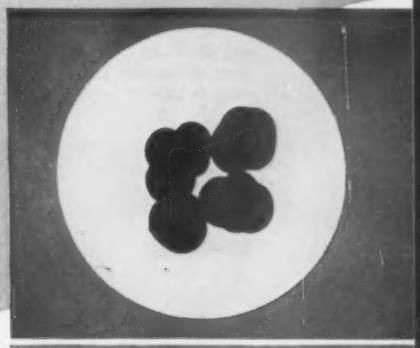


UNTREATED lower-cost fuel oil sample, magnified 8400X, shows objectionable sludge particles that cause poor combustion, clogged filters and sticking injectors.

TREATED, same lower-cost fuel oil, same magnification as above, shows how Nalco SR-158D disperses sludge, reduces particle size.

THE *Nalco*® SYSTEM . Serving Railroads through Practical Applied Science

will be responsible for the sales and service of Exide industrial batteries in Maine, Vermont, New Hampshire, Massachusetts, and part of Connecticut.

■

DEARBORN CHEMICAL COMPANY.—*Herbert G. Mastin*, assistant vice-president, Eastern Railroad Division, has been placed on semi-retirement, but will continue to represent Dearborn in the New England terri-

Herbert G. Mastin

tory to the extent his health will permit. *Richard C. Newth*, special engineer, Eastern Railroad Division, has been appointed supervisor, sales and service, Eastern Railroad Division.

■

GUSTIN-BACON MANUFACTURING COMPANY.—*K. H. Crone* has been appointed division manager of the New York sales

K. H. Crone

offices. Mr. Crone, who has been associated with Gustin-Bacon since 1946, was assistant Chicago division manager before coming to New York.

■

INTERNATIONAL EQUIPMENT COMPANY, LTD.; INDUSTRIAL EQUIPMENT COMPANY, LTD.—*J. MacInnes* has been appointed assistant vice-president at Montreal. Mr. MacInnes for the past eight years had been with the Superheater Company, Ltd., at Montreal.

■

LEWIS-SHEPARD PRODUCTS, INC.—*Thomas A. Murphy*, manager of the Chicago sales office, has been appointed district sales manager at Chicago.

UNITED STATES STEEL CORPORATION, AMERICAN STEEL & WIRE DIVISION.—*Maxwell D. Millard*, Detroit district manager of sales, has been appointed assistant general manager of sales at Cleveland. He has been succeeded at Detroit by *Edward A. Murray*, who previously served the division in various sales executive positions, but for the past two years has been vice-president, sales, of the Appleton Electric Company.

■

Vertner S. Kenerson is now representing Flexible Steel Company in the Carolinas, Virginia and east Tennessee, taking over part of the area formerly covered by *Austin Webster*, retired.

■

INTERNATIONAL STEEL COMPANY.—*Karl T. Nystrom* has been named assistant manager of the railway division. Mr.

K. T. Nystrom

Nystrom was previously associated with the Standard Railway Equipment Manufacting Company.

■

NATIONAL VULCANIZED FIBRE COMPANY.—*Harry C. Hackett*, sales manager, has been appointed staff sales manager. *James O. Otis*, assistant sales and advertising manager, has succeeded Mr. Hackett as sales manager.

■

PYLE-NATIONAL COMPANY.—*F. Lee Davis* has been appointed manager of industrial sales, and *Frank M. Currie* has been appointed supervisor of field sales. A district sales office has been opened at 80 East Jackson boulevard, Chicago, under the direction of *John H. Devol*, district manager. Pyle National has purchased the patterns, tools, dies, jigs, fixtures and inventory of two lines of electrical products from the *Adapti Company*. The products, consisting of conduit fittings and vaportight lighting fixtures, will be manufactured and sold under the trade name of "Pylets."

■

STANLEY H. SMITH COMPANY.—*R. E. Schatmeyer* has been appointed sales manager and *John J. Schneider* has been appointed to the sales staff at Cleveland.

■

WEST STEEL CASTING COMPANY.—The *Ellcon Company*, New York, has been appointed eastern representative of the West Company of Cleveland, for sale of electric steel castings for railroad and industrial use.

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION. — *Victor E. Rennix*, regional sales manager, has been appointed general sales manager at Chicago, succeeding *W. N. Fritts*, transferred to special duties. *George W. Rukgaber*, district sales manager at Chicago, succeeds Mr. Rennix. *Charles L. Moss*, district sales manager at New York, has been ap-

Victor E. Rennix

pointed regional sales manager at Jacksonville, Fla., succeeding *A. O. Myers*, who is now industrial sales engineer at La-Grange, Ill. *Harold P. Gustavson*, sales representative at New York, has been appointed district sales manager there, and *Robert B. Johnstone*, assistant regional service manager, has been named sales representative at New York.

■

AMERICAN LOCOMOTIVE COMPANY.—*A. T. Lawrance* has been appointed regional sales manager, Alco Products division, with headquarters in Houston, Tex.

■

GRAYBAR ELECTRIC COMPANY.—*R. B. Sayre*, assistant vice-president, has been elected vice-president, at New York.

R. B. Sawyer

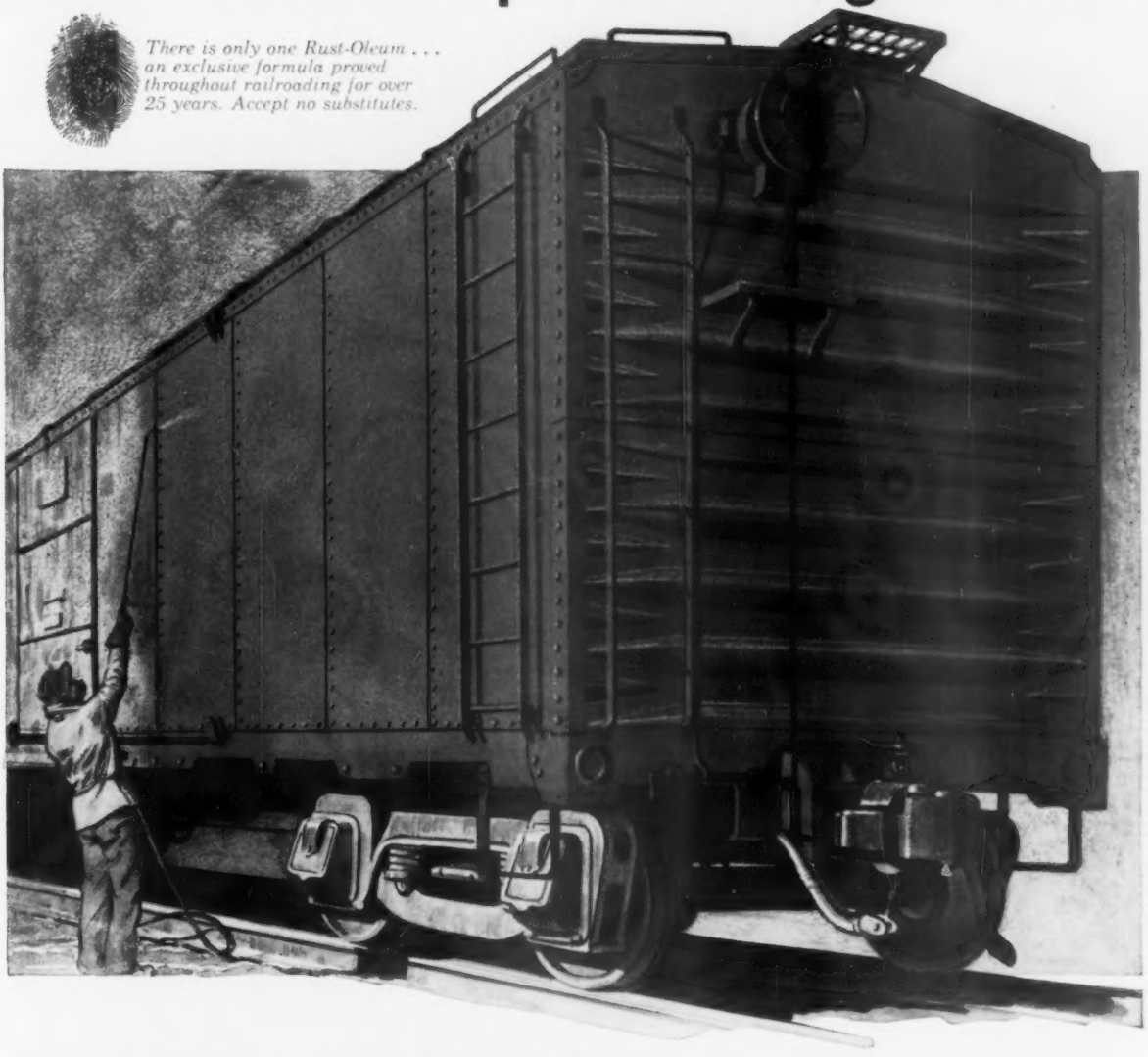
MOTOR OILS REFINING COMPANY.—*R. E. Poindexter*, lubrication engineer, has been appointed general sales manager at Lyons, Ill.

■

GENERAL AMERICAN TRANSPORTATION CORPORATION.—*Joseph C. Thompson* has been appointed manager eastern sales, and *Thomas A. Hartley*, manager New

RUST-OLEUM keeps 'em looking like this!

There is only one Rust-Oleum . . . an exclusive formula proved throughout railroading for over 25 years. Accept no substitutes.



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STOPS RUST!

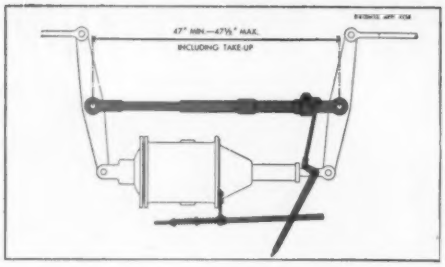
Protect *new* metal surfaces . . . save even *badly rusted metal!*—and cut maintenance costs, too. Simply scrape and wirebrush to remove rust scale and loose particles . . . then brush Rust-Oleum 769 Damp-Proof Red Primer directly over the *sound rusted surface*. Sandblasting, chemical pre-cleaning and other costly preparations are *not* usually required. You save time, money, and metal on bridges, rolling stock, signal equipment, tanks, buildings, towers, etc. See how Rust-Oleum can save you money . . . why major railroads all over the country rely upon Rust-Oleum. Get the *complete* story from a Rust-Oleum Railroad Rust Preventive Specialist!

RUST-OLEUM CORPORATION

2590 Oakton Street, Evanston, Illinois

Write for your copy of the new Rust-Oleum Catalog, *today!* Available in many colors, aluminum, and white.

The Franklin Automatic Brake Slack Adjuster



Adjuster is fully automatic in maintaining the predetermined travel of the brake cylinder piston. Operating on the pawl and ratchet principle, it has sufficient take-up so that no manual adjustment is required during the life of the brake shoes. It replaces, or is installed in, the pull or tie rod connection, and is easily applied to any type of new or existing freight cars — including hopper cars.

On cars equipped with the Franklin Automatic Brake Slack Adjuster, it is not necessary to disconnect the brake rigging to replace worn brake shoes. Also, a simple and convenient reset arrangement, operated from outside the rails, restores the desired piston travel before the car is returned to service.

Bulletin B-1201 gives full information.

FRANKLIN BALMAR CORPORATION

FRANKLIN BALMAR CORPORATION
WOODBERRY, BALTIMORE 11, MD.

Chicago Office:
5001 North Wolcott Ave., Chicago 40

Tex., district office at 2480 Times boulevard; *Byron M. Hoskins*—Philadelphia district office at 9 Rittenhouse Place, Ardmore, Pa., and *W. G. Rawson*—Seattle, Wash., district office at 350 Skinner building.

■

COLORADO FUEL & IRON CORP.—*Floyd O. Johnson, Jr.*, has been appointed railroad sales engineer, railroad sales department. Mr. Johnson was previously employed by the Pennsylvania in various capacities in the engineering and maintenance department, his latest assignment having been main line assistant supervisor.

■

EX-CELL-O CORPORATION OF CANADA.—*John Gilchrist* has been appointed managing director of Ex-Cell-O Corporation of Canada, a new subsidiary of Ex-Cell-O Corporation, Detroit, with a plant in London, Ont. Mr. Gilchrist was formerly president of a company manufacturing power tools. *Jack L. Mustard*, assistant sales manager, Precision Products division, has been named assistant general sales manager of the Industrial division.

Obituaries

ABNER D. BAKER, inventor of the Baker steam locomotive valve gear, died in Swanton, Ohio, on June 17, 1953, at the age of 92. Mr. Baker organized the A. D. Baker Company in 1901 to manufacture steam traction engines. The Baker valve gear was

York sales, of the Plate and Welding division, both with offices at 380 Madison avenue, New York. Mr. Thompson will cover the states of New Jersey, eastern Pennsylvania, Delaware, Maryland, Virginia, and parts of New York City. Mr. Hartley's territory includes New York State and the New England area.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*Robert B. Smith* has been appointed manager of the renewal parts section of the Transportation and Generator division. Mr. Smith will be responsible for sale of renewal parts for all apparatus built by the division.

■

AMERICAN STEEL FOUNDRIES.—*Joseph A. Cademartori* has been appointed general manager, Elmes and King division, succeeding *Charles F. Elmes*, vice-president and general manager since 1943, who has resigned. *George C. Marakas* has been placed in charge of sales for the division.

■

WINE RAILWAY APPLIANCE COMPANY.—*Orville Ingram* has been appointed vice-president—sales, with headquarters at Washington, D. C. Mr. Ingram was formerly assistant to the president of that company. He is also assistant to vice-president of the Unitcast Corporation.

■

WHITING CORPORATION.—The following have been appointed sales engineers: *William C. Esch*—Ohio district office at 729 Federal Reserve Bank building, Cincinnati; *Paul Schnackenberg*—Houston,

for QUICK, CLEAN, UNIFORM HEAT at LOW OPERATING COST—

JOHNSTON SLOT-TYPE FORGING FURNACES

★ OIL OR GAS FIRED

★ SINGLE OR MULTIPLE SLOT TYPES

This furnace will maintain uniform neutral or reducing atmosphere for forging and welding which will avoid scale and decarburization. Construction features water, refractory or cast iron shields. Fire brick and insulating refractory brick lining with chrome refractory hearths are new features to reduce maintenance and operating costs and speed production.

★ BURNERS ★ BLOWERS ★ FURNACES ★ RIVET FORGES
★ FIRE LIGHTERS ★ TIRE HEATERS, ETC.

THE JOHNSTON LINE — SAFETY — DEPENDABILITY

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2825 EAST HENNEPIN AVE.
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ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

NOT A CRACK IN A CARLOAD

when the car is cushioned with "RAILWAY" SPRINGS

Fragile freight shipments arrive intact—and with no lading claims to follow—in cars equipped with "Railway" springs.

These rugged, long travel coil springs pamper your loads in a way that pleases your shippers, cuts wear and tear on your rolling stock and lowers roadbed maintenance costs.

Specify "Railway" on your next order, and get the expert services of Alco, a pioneer in the development of all types of springs to assure longer life and smoother operation for rolling stock.

RAILWAY STEEL-SPRING DIVISION

AMERICAN LOCOMOTIVE COMPANY

NEW YORK • CLEVELAND • CHICAGO
RICHMOND • ST. LOUIS • ST. PAUL
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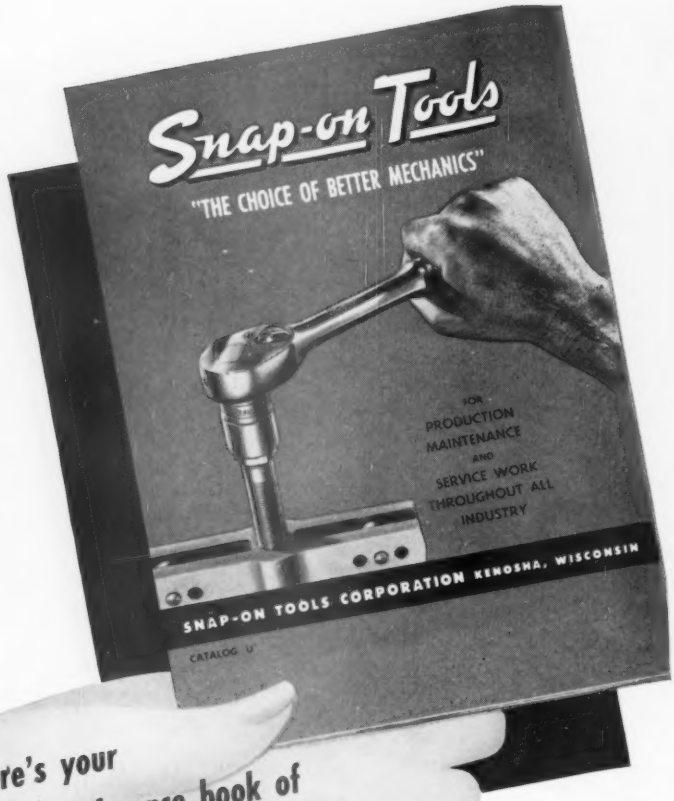

Here's your handy reference book of 4,000 time-saving tools for production and maintenance

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WRITE FOR YOUR COPY TODAY!

You'll want this latest 104-page edition of the most complete, most informative tool catalog published! This catalog lists all sizes and types of wrenches from largest needed on heavy machines to small ones for use on delicate instruments. Special tool equipment for fast repair of diesel and other engines. Includes new tools engineered by Snap-on to help handle difficult jobs with greater speed and safety. Write for your copy today.

SNAP-ON TOOLS CORPORATION
RAILROAD DIVISION
8130-B 28th Avenue, Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.

first tested on a Toledo, St. Louis & Western steam locomotive in 1909. In 1910 that model was discontinued and replaced by the Baker-Pilliod gear, later known as the Baker gear, for which patents were issued on August 20, 1912. At that time, Mr. Baker, together with the late F. E. Pilliod, began manufacturing the gear, later forming the Pilliod Company in Swanton.

■

E. J. FULLER, retired vice-president and general manager of the Hunt-Spiller Manufacturing Corporation, died on December 3. Mr. Fuller had been with Hunt-Spiller since 1914. He was, successively, mechanical representative, assistant sales manager, and sales manager until 1936 when he became vice-president and general manager.

PERSONAL MENTION

Bessemer & Lake Erie

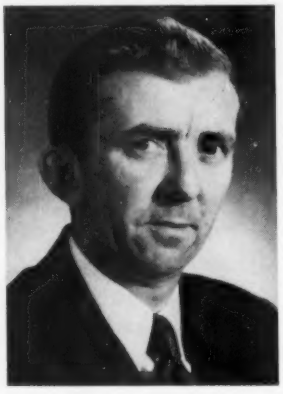
Office and positions of engineer motive power and assistant engineer motive power discontinued. Locomotive departments at various points will report direct to superintendent motive power and/or assistant superintendent motive power.

S. B. SCHENCK, engineer motive power, appointed special engineer, reporting to superintendent motive power. Headquarters, Greenville, Pa.

C. R. ROSENBERG appointed assistant engineer, reporting to mechanical engineer. Headquarters, Greenville, Pa.

Canadian National

W. J. HART, chief car draftsman, appointed mechanical engineer (car) at Montreal.



W. J. Hart

Career: Joined CNR at Montreal in 1936 as a carman apprentice. During World War II served with the Royal Canadian Mechanical and Electrical Engineers, returning to CNR in 1945 as coach carman. Subsequently served as shop apprentice instructor; equipment inspector; draftsman, and chief car draftsman.

ONE THIRD OF A MILLION

more than 340,000 car sets of

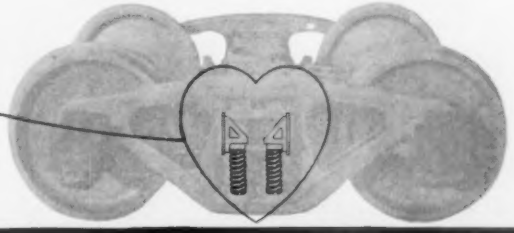
BARBER STABILIZED FREIGHT CAR TRUCKS

have been ordered to date!
This is because *Barber Stabilized Trucks* have proven their ability to ride best for most loads.

With *Barber Stabilized Trucks*, every kind of Lading gets a cushioned car ride, and the shock absorbing action of *Barber Stabilized Trucks* also protects both car and rail.

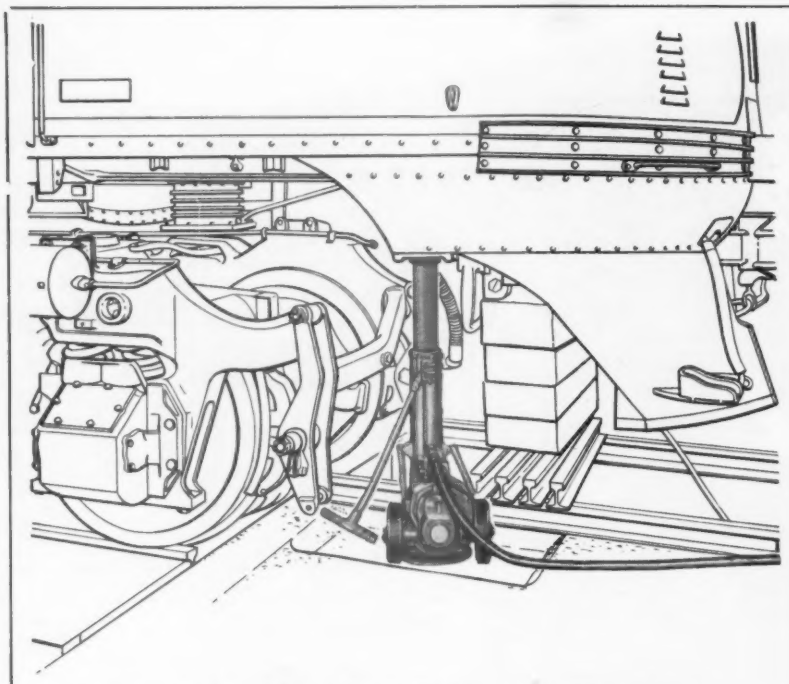
easy to Assemble
easy to Dismantle
easy to Service!
Mighty *easy* Riding.

Barber Side Springs carry part of the load, increasing bolster spring capacity and reducing net cost.



STANDARD CAR TRUCK COMPANY
332 SOUTH MICHIGAN AVE.
CHICAGO, ILLINOIS

496



How One Man Can Raise the Heaviest Diesel Locomotive in a Few Minutes!

Take two Duff-Norton Air Motor Power Jacks, wheel them into position under the locomotive frame, connect them with an air hose "Y," turn the valve that starts compressed air into the jacks' built-in air motors, then sit down if you wish and watch as the load goes up evenly, smoothly, safely—in a few minutes you can proceed with repairs. Locomotive trucks, for example, can be completely replaced in about 2 hours!

Tests conducted by various railroads in their own shops have shown savings in time and labor that pay for these air motor jacks in a few months.

Get the complete specifications of the various time and labor-saving Duff-Norton Air Motor Power Jacks. They vary in capacity from 20 to 100 tons. Write the world's oldest and largest manufacturer of lifting jacks for catalog AD-11G, The Duff-Norton Manufacturing Company, P. O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON

"Giving Industry A Lift Since 1883" **Jacks**

HAROLD G. NEALE, assistant chief draftsman, appointed chief car inspector.

VINCENT MCCARTHY, traveling engineer, appointed master mechanic, Newfoundland district, with headquarters at St. John's.

H. C. T. BOYD appointed assistant chief of research at Montreal.

Canadian Pacific

R. B. WINSHIP, mechanical engineer (car) at Montreal, has retired.

Career: Joined CPR at Montreal in 1920

R. B. Winship

as chief draftsman in the chief mechanical engineers' department. Became assistant mechanical engineer in 1937 and mechanical engineer (car) in 1941.

W. F. SINCLAIR, engineer of diesel equipment, appointed to newly created position of engineer of motive power at Montreal. Former position abolished, also position of mechanical engineer (locomotive).

CHARLES HASSALL, engineer of car equipment, has taken over the duties of mechanical engineer (car), but retains the title of engineer of car equipment.

A. E. MCGRUER, general electrical engineer at Montreal, appointed engineer of electrical equipment. Former position abolished.

Chesapeake & Ohio

H. S. PATTERSON appointed road foreman of engines, with headquarters at Peru, Ind.

Chicago, Milwaukee, St. Paul & Pacific

C. E. BARRETT, district general car foreman at Tacoma, Wash., appointed assistant superintendent car department at Milwaukee.

W. J. WEATHERALL, assistant district general car foreman at Savanna, Ill., appointed district general car foreman at Tacoma, Wash.

Erie Railroad

WILLIAM F. HEDDEN, road foreman of engines at Jersey City, transferred to the position of road foreman of engines at Youngstown, Ohio.

HOWARD B. HART, supervisor of air brakes at Cleveland, appointed road foreman of engines, New York division, with headquarters at Jersey City.

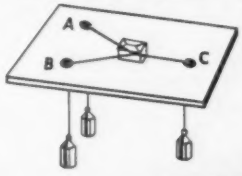
Famous Problems IN RAILROADING

A dispatcher has at his disposal 10 cars, including a tank car and caboose, with which to make up a freight train. With no restrictions other than that the tank car must be placed at least two cars away from the locomotive — in how many ways can he make up the train? Pity the poor crew!

See next month's Spicer Generator Drive advertisement for correct answer.

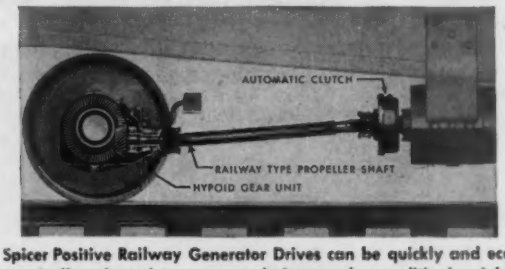
SOLUTION TO LAST MONTH'S PROBLEM

The diagram here suggests a simple but clever solution. The map is spread on a board, through which have been drilled three holes, corresponding to the positions of the towns. If three strings—knotted together — are passed through the holes and weighted at the lower ends in the proportion of 35, 50 and 65 (or 7, 10 and 13) respectively, the station should be located where the knot comes to rest.



Famous Solutions TO RAILROADING PROBLEMS

The steady and growing adoption of the Spicer Generator Drive . . . *now totalling over 10,000 installations on over 70 American railroads* . . . indicates proof of superior efficiency in delivering electrical energy for railway car use.



Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs.

The Spicer Railway Generator Drive consists of a very simple application of long-lived hypoid gear and pinion mounted on the standard axle. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Automatic Clutch mounted between the generator and the propeller shaft. This automatic clutch completely absorbs all shocks and disconnects the drive line in case of excessive overload, and also completely disconnects the generator at speeds below 8 miles per hour eliminating shock loads when cars are being shunted.

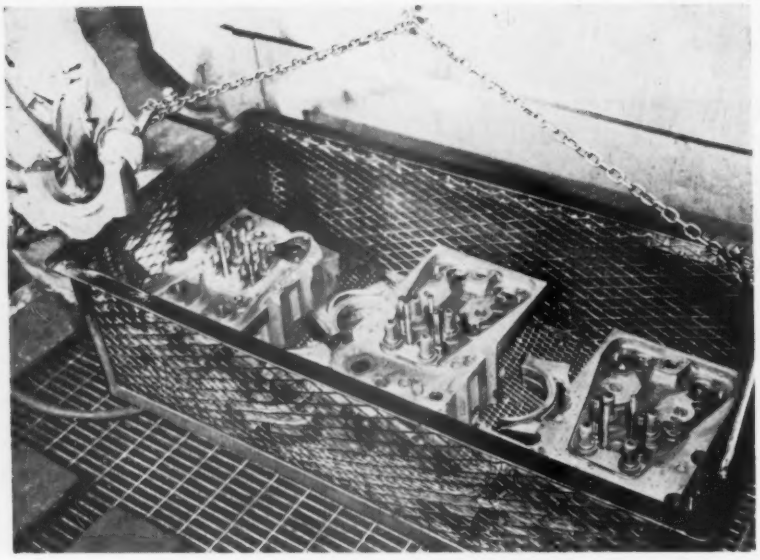
Write for illustrated literature.

The Spicer Railway Generator Drive is manufactured, sold and serviced by

SPICER MANUFACTURING DIVISION
OF DANA CORPORATION
TOLEDO 1, OHIO

50 YEARS OF Spicer SERVICE

ENGINEERING DANA MANUFACTURING



Diesel engine heads cleaned in 2 hours in Magnus Aja-Dip with Magnus Decarbonizing Cleaner.

Can You Afford To *Ignore* These Savings?

Diesel Parts Cleaning

LABOR: 95% of the Hand Labor Saved.

COST OF CLEANER: 60% of the Cost Saved.

CLEANING TIME: 50% or More Cleaning Time Saved.

When you use the Magnus Aja-Dip Cleaning Machine, with Magnus Decarbonizing Cleaner, you can count on this kind of saving compared with your present methods. An average of at least two, and usually three, men are released for other work when the Magnus method is employed.

Proof of Performance

Today, well over 80% of the total railroad diesel horsepower in service on American railroads is being cleaned by the Magnus method. Let us show you why and how!

magnus CLEANERS

Railroad Division

MAGNUS CHEMICAL CO., INC.

77 South Avenue, Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., Montreal

Representatives in All Principal Cities

Great Northern

A. B. COLVILLE, superintendent motive power at Spokane, Wash., has retired.

R. A. SMITH, assistant to chief mechanical officer at St. Paul, appointed superintendent motive power at Spokane, Wash.

H. A. M. WHYTE appointed assistant to chief mechanical officer at St. Paul.

New York Central

A. F. HAGY, general inspector, shops and projects at New York, appointed assistant to general superintendent—passenger cars, with headquarters at New York.

H. J. YOUNG, superintendent of shop—car at Beech Grove, Ind., has retired.

GEORGE R. GIVIDEN appointed superintendent shop—car at Beech Grove, Ind.

C. M. FERGUSON, general foreman West Detroit (Mich.) car shop, appointed general inspector, shops and projects, with headquarters in New York.

F. F. DUBAY appointed general foreman of West Detroit car shop, with headquarters at W. Detroit, Mich.

H. J. GRAY appointed district supervisor—management services, New York.

G. M. FEDERICI appointed general car foreman at Buffalo.

T. J. MOLLOY appointed district supervisor—electric equipment.

G. E. LAUTERBACH appointed district industrial engineer—equipment at New York.

STANLEY PETROWSKY appointed welding supervisor.

Reading

H. F. LYONS, assistant superintendent, car department, appointed superintendent, car department, at Reading.

FREDERICK J. MAY, assistant trainmaster, Shamokin division, appointed assistant superintendent, car department, at Reading.

Seaboard Air Line

E. A. THURMOND appointed diesel supervisor (system), with headquarters at Jacksonville, Fla.

J. C. WROTON, JR., assistant to diesel superintendent at Norfolk, Va., appointed diesel supervisor (system), with headquarters at Hamlet, N. C.

W. G. T. TUTTLE appointed assistant to diesel superintendent at Norfolk, Va.

Southern

AUBREY M. CARY, mechanical engineer at Washington, D. C., appointed to newly created position of manager of Hayne shop at Spartanburg, S. C.

ROBERT S. HAMILTON appointed to newly created position of plans engineer (mechanical department), with headquarters at Washington, D. C. Mr. Hamilton will direct and supervise a continuing study and analysis of shop methods and procedures throughout the entire railway system.

CECIL D. SCHWINE, JR., master mechanic at Birmingham, Ala., appointed to newly created position of manager of Coster shop at Knoxville, Tenn.

"WOLMANIZED*"... clean pressure-treated lumber preferred by construction crews.

American Lumber & Treating Company

General Offices: 1601 McCormick Building, Chicago 4, Ill.

Branch Offices: Baltimore • Boston • Jacksonville, Florida
Little Rock, Arkansas • Los Angeles • New York
Portland, Oregon • San Francisco • Seattle

*Wolmanized is a Registered Trademark of American Lumber and Treating Company.

Wolmanized PRESSURE TREATED **Lumber**

Stops Rot and Termites

YOUR CATALOG

OF HARDENED AND GROUND STEEL

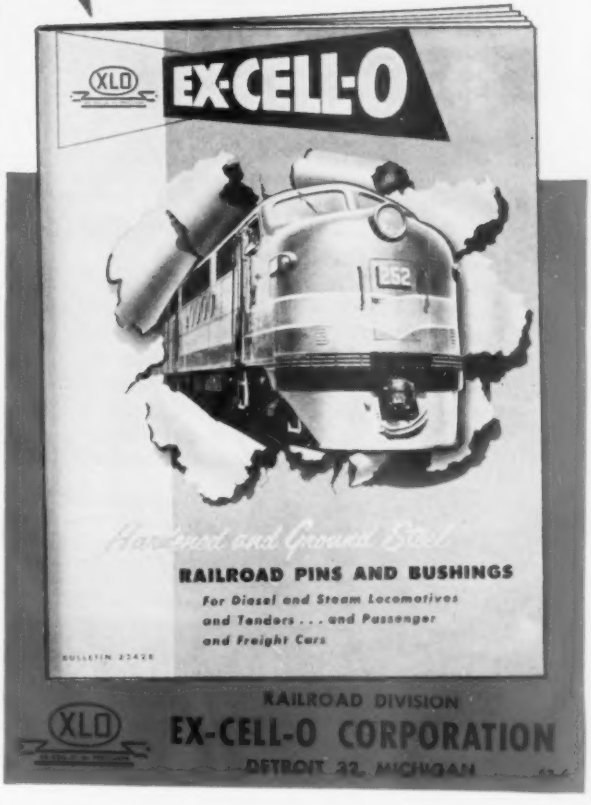
PINS AND BUSHINGS

Have within easy reach this catalog of STANDARD SIZES AND STYLES of Ex-Cell-O's long-service-life pins and bushings.

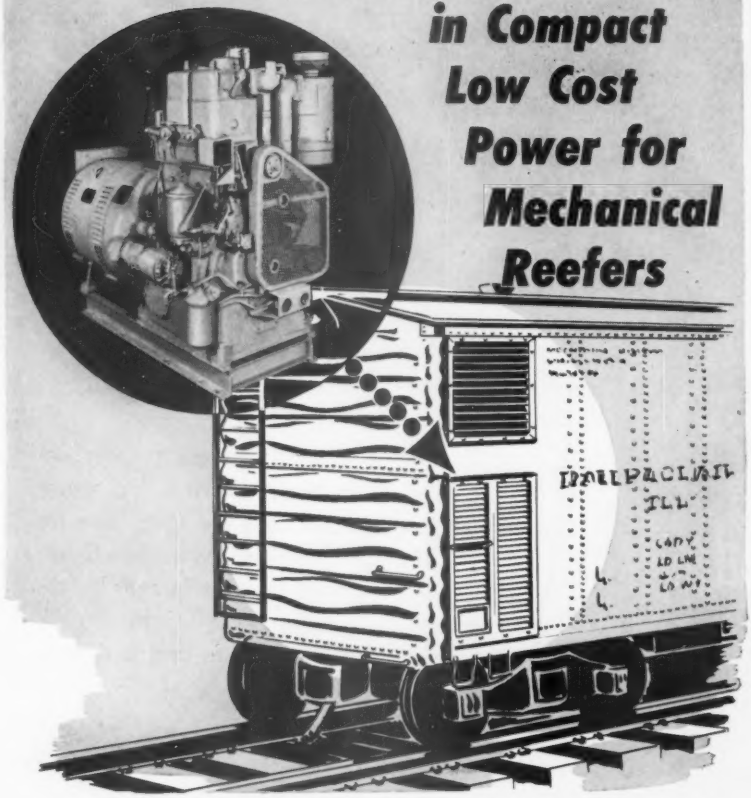
Ex-Cell-O heat treatment gives an extremely hard surface for wear resistance, a tough ductile core to withstand shocks and vibration. Over 200 railroads and equipment builders depend on Ex-Cell-O hardened and ground steel Pins and Bushings.

SEND FOR IT

Write to Ex-Cell-O for Bulletin 32428



here's the BIG NEWS in Compact Low Cost Power for Mechanical Reefers



● Mechanical reefers are becoming one of the most important and dramatic developments in modern railroading. And as the key factor in providing dependable, low cost power for mechanical refrigeration systems—NORDBERG is furnishing Diesel generator sets that are "tailor-made" for this important service.

These NORDBERG Diesel generators are built in two basic sizes for mechanical reefers . . . a 15 KW unit for 10-ton systems—and a 25 KW unit for 15-ton systems. Here are some of the exclusive advantages you get with NORDBERG Diesel power:

- *Extremely compact* — "in line" installation means more available space for cargo.
- *Fully dependable* — conservative engine ratings, plus proved heavy duty construction assures easy starting, long life, with extremely low operating and maintenance costs.
- *Simplicity of design* — no sensitive controls to require constant adjustment. Fast, easy maintenance.
- *Backed by service and experience second to none* . . . from the builder of America's largest line of heavy duty Diesels — from 10 to over 10,000 horsepower.

For the best *in dependable, low cost power to meet your mechanical refrigeration needs, be sure to specify NORDBERG Diesels. Write for complete details.*

4-154-R

Made by the Makers of "Mechanical Muscles" (Trademark)

NORDBERG MFG. CO.
Milwaukee, Wisconsin

NORDBERG MACHINERY

Southern—*Continued*

MANLEY H. HAMMETT, assistant diesel superintendent at Washington, D. C., appointed master mechanic at Birmingham, Ala.

L. FRED SMITH, diesel engineer at Washington, D. C., appointed mechanical engineer at Washington.

FRANK E. STUBBS, general diesel supervisor, Central Lines, appointed assistant diesel superintendent at Washington, D. C.

JOHN L. STUBBS appointed general diesel supervisor at Knoxville, Tenn.

COLMAN F. HARVEY, electrical engineer at Washington, D. C., appointed diesel engineer at Washington.

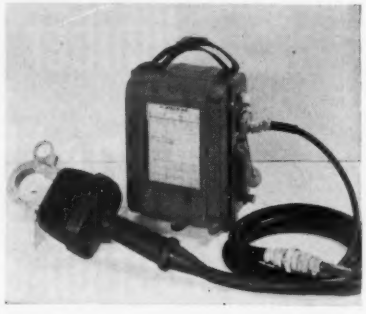
THOMAS E. STEWART appointed foreman coach shop, Hayne shop, Spartanburg, S. C.

Texas & Pacific

FORREST R. DENNEY, assistant mechanical superintendent at Dallas, appointed supervisor of equipment at New Orleans.

NEW DEVICES

(*Continued from page 92*)



Recording Hook-on Volt-Ammeter

A portable recording instrument for obtaining a permanent record of alternating current and voltages has been developed by the General Electric Company's Meter and Instrument Department, Schenectady 5, N. Y.

The new volt-ammeter, designated G-E Type CF-7, combines features of a self-latching multirange hook-on current transformer and the simplicity of the Type CF inkless recorder in equipment suitable for indoor and outdoor applications.

It is expected to be particularly useful for checking loads on distribution lines, verifying motor loads, and in detecting overload circuits, transformers, motors and other a.c. apparatus.

The equipment consists of a hook-on current transformer, a connecting lead, and an inkless recording volt-ammeter. All three components are completely interchangeable with no sacrifice in accuracy.

Featuring a self-supporting hook suitable for all conductors up to 2 in. in

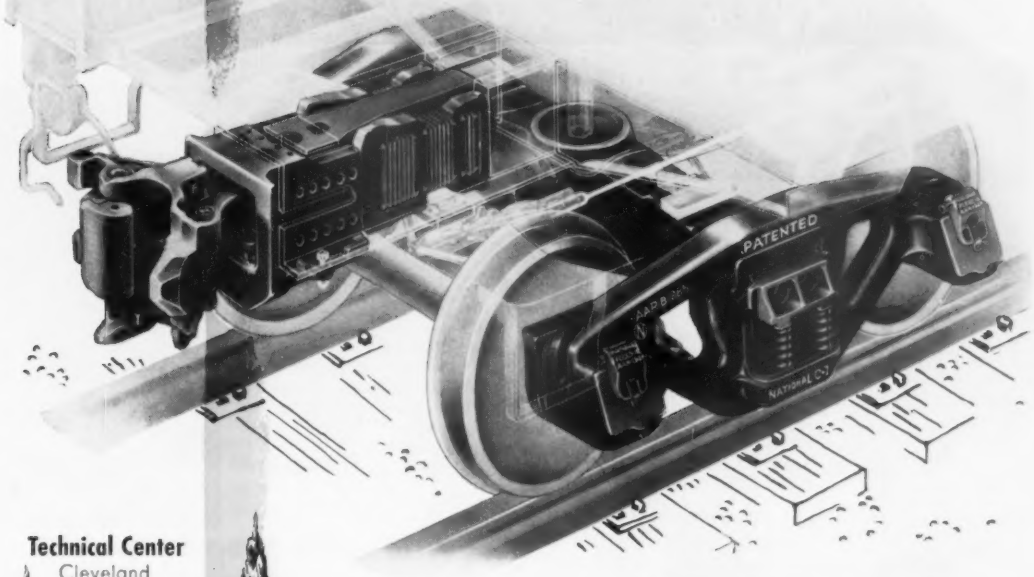
(*Continued on page 110*)

The smoothest distance between two points—

National products smooth out end-to-end, vertical and lateral shocks . . . make satisfied shippers by reducing lading damage.

Improvement of riding qualities is a basic concept of National design philosophy —and has been for over 85 years.

NATIONAL Draw Gear Assemblies and Freight Car Trucks



"Progress through Research"

Products by National shown:
AAR Type F Interlocking Coupler
Y-45 Yoke
MF-260-1 Rubber Cushioned Draft Gear
C-1 All-Purpose Truck
Flexo-4 Journal Box Lids

A-8799

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

NATIONAL EST. 1868 PRODUCTS and TECHNICAL SERVICES

COUPLERS • YOKES • FREIGHT TRUCKS • DRAFT GEARS—RUBBER AND FRICTION • JOURNAL BOXES AND LIDS

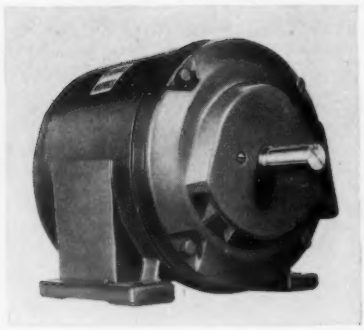
WIEDEKE IDEAL
TUBE EXPANDERS
for rolling sleeves in diesel cylinder heads

Typical cross section of Cylinder Head showing Sleeve. Expander with short Mandrel used at upper end. Expander with long Mandrel used at lower end.

Two style Expanders are shown, other styles quoted promptly. Please supply us with full details of your requirements.

See your Dealer or write us for Bulletin.

THE GUSTAV WIEDEKE COMPANY
DAYTON 1, OHIO



materials, ventilation, heat transfer and more efficient electrical designs by Reliance has made possible greater horsepower in more compact space with equal and in some cases even greater liberality than in past designs. Research has also led to better protection of the motor windings, leads and bearings.

The first of the new motors to appear will be built for 1, 1½ and 2-hp. applications, in frame sizes 182 and 184. The balance of the line, up to and including 30 hp., will be introduced at regular intervals during 1954 and the early part of 1955. The present Reliance a.c. line will continue to be available during this change-over period to fill the needs of those users who wish to complete current projects with motors as they are now being built.

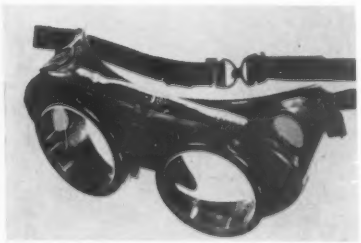
■

NEW DEVICES

(*Continued from page 108*)

diameter, the transformer provides current anges from 15 to 750 amp., selected by a range-changing switch on the side of the instrument. The recorder itself measures the voltages in three ranges (0-150/300/750 volts) by means of the range-changing switch. The equipment weighs 18¾ lb. including a 10-ft. lead.

■



Safety Goggles

These goggles for wear over prescription glasses are offered in two versions, a chipping style with clear, heat-treated lenses and a welding style with choice of filter lens shades.

Known as Kover-Mor and introduced by Willson Products, Inc., Reading, Pa., they will provide a comfortable fit with ample room for clearance over large-frame prescription lenses. The goggles utilize molded nylon eye cups.

Standard 50 mm. round lenses are used in both styles, eliminating need for stocking odd-size replacement lenses. A rigid top bar is standard to provide an adjustment to the individual user's face. Two-way ventilation is provided through slots in the lens retaining rings, and screens in the eye cups.

■

Protected and Enclosed Motors

A line of well-protected, squirrel-cage induction motors is being introduced by the Reliance Electric and Engineering Company, 1088 Ivanhoe Road, Cleveland 10, Ohio. The line, including protected and enclosed motors for all industrial purposes, is being built to recently adopted standards of the National Electrical Manufacturers Association.

Research in the fields of new insulating

Steel Cutting Cemented Carbide

Capable of stepping up machining operations by as much as 30 per cent, while providing 50 per cent longer tool life than existing carbides, the Carboloy Grade 370 cemented carbide was developed for taking heavy cuts at tool temperatures as high as 1800 deg. F. Announced by the Carboloy Department of General Electric Company, Detroit 32, it is the first grade in a new carbide series.

The blank, suitable for severe cutting

(*Continued on page 114*)

RAILWAY AGE

Authoritative Weekly

Your magazine of management, news and interpretation — covering the whole field of railroading.

Established 1856

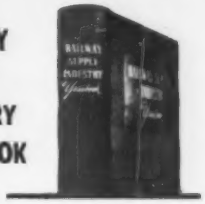
RAILWAY AGE

Railway Age is the *weekly* business paper of the railway industry . . . the recognized authority on railway matters. Through it, railway executives, operating officers, departmental officers and their staffs keep abreast of current events in the whole field of railroading.

Edited from the *business* point of view, it reports the news of the industry . . . interprets events and developments . . . alerts its readers to significant trends. It covers news from Washington, D. C. through its Washington staff . . . champions new developments in equipment and facilities. *Railway Age* is the publication that receives top priority reading from key men and those rising to important positions who must keep on top of events as they occur.

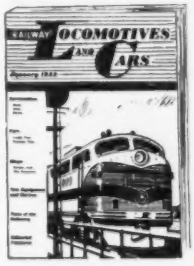
Paid subscriptions to *Railway Age* on the railroads today stand at the highest level in its history . . . emphasizing the importance railway men place on reading this business magazine.

RAILWAY SUPPLY INDUSTRY YEARBOOK



1954 Edition in Preparation

Comprehensive roster, catalog and directory of the whole railway supply industry, including key personnel, products, services and trade names. Copies available in every important railway office for use of those who select, specify and purchase railway products for every branch of railroading. Four main sections include "Who's Who" in the railway supply industry; Suppliers' Catalog Section; Directory of Products; Trade Names of the railway supply industry. Closing date, 1954 edition, March 1, 1954.



Est. 1832

RAILWAY LOCOMOTIVES AND CARS

Published monthly, *R.L.&C.* is the specialized publication of railway mechanical and electrical officers and supervisors. Technical and practical in its editorial viewpoint, *R.L.&C.* keeps the reader abreast of developments, new practices and products that have to do with the design, construction, efficient operation and repair of locomotives, freight and passenger cars and the equipment and operation of shops. Its series "Diesel Electrics—how to keep them rolling," its freight and passenger car articles and shop articles are typical features.

CAR BUILDERS' CYCLOPEDIA

New 19th edition, the standard reference work on all types of freight and passenger cars—their design, construction, parts, maintenance and repair. In 19 main sections, 1,200 pages and 3,000 illustrations, new edition provides descriptive text, photographs, diagrams and product catalog data covering the whole railway car field. Has dictionary of terms. Single copies $12.00.

9 Simmons-Boardman Railway Publications

Railway Age (Weekly), Railway Freight Traffic (Monthly); Railway Locomotives and Cars (Monthly); Railway Track and Structures (Monthly); Railway Signaling and Communications (Monthly); Railway Supply Industry Yearbook (1954); Car Builders Cyclopedia (1953); Locomotive Cyclopedia; Ry. Engineering & Maint. Cyclopedia.

BOOKS ON TRANSPORTATION AND BUILDING

Simmons-Boardman publishes a large list of books on transportation and building subjects.

Simmons-Boardman publications

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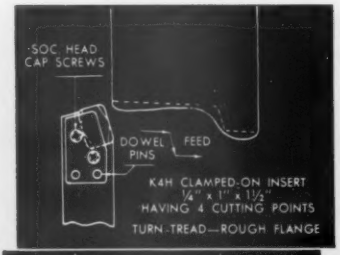
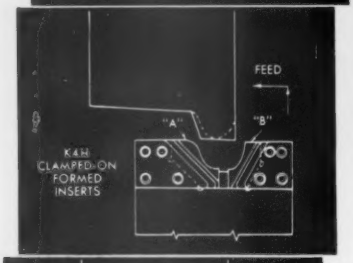
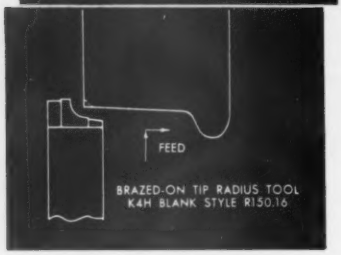






ARE YOU INTERESTED...

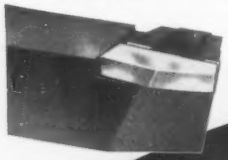
IN SAVING 66% OF THE TIME TAKEN TO MACHINE WHEELS?

It's being done. Rugged, durable Kennametal tools, in a modern machine operated at higher speeds, enable a railroad shop to reduce—66%—the time formerly required to rework the tread and flange of 36" diameter cast steel car wheels.*

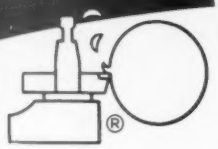
The tool set-up is sketched above. Tools designed for the job use standard Kennametal grade K4H inserts—take a cut 1/16" to 3/4", .030" feed, at 12 to 15 RPM—with the result that each pair of wheels is reconditioned in 27 minutes, 5 seconds, floor to floor time.

Are *you* interested? Ask our district engineer to bring you the latest facts on cost-saving advancements in Kennametal tooling for railroad shops. Kennametal Inc., Latrobe, Pa.

*Performance study will be sent upon request.



KENNAMETAL
Modern RAILROAD SHOP TOOLING



52-7

WHEN CRITICAL MATERIAL IS SCARCE—

Repair POWER CABLES with AMP SOLDERLESS CONNECTORS

HEAVY DUTY PNEUMATIC TOOL #69015

Either "STUB" or conventional side position crimping with AMP's double-handled Pneumatic Tool. Interchangeable jaws for wire sizes #6 to #1/0.

SOLISTRAND® BUTT CONNECTORS

Can be used on solid, stranded or irregular shaped wire. These pure copper connectors make strong, vibration-proof permanent splices #22 to #4/0.

AMP

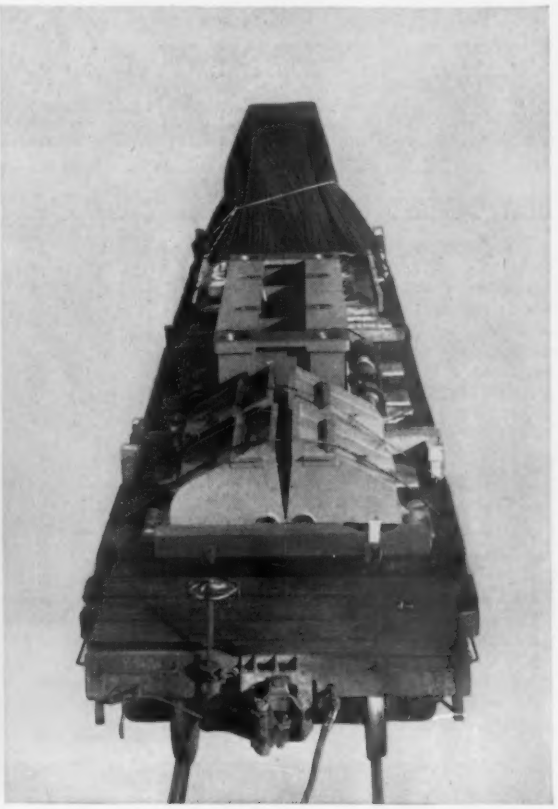
AMP TRADE MARK REG. U.S. PAT. OFF.

AIRCRAFT-MARINE PRODUCTS, INC.
2100 Paxton Street, Harrisburg 13, Pa.

PENTA

DOW

PROTECTS CAR LUMBER AGAINST HIDDEN DECAY



This clean wood preservative controls rot and decay —cuts your replacement costs 50% or more!

Railway authorities now recognize that mechanical wear is hastened by the early, unseen stages of decay. Preventing this decay with Penta* means fewer trips to the repair shop for lumber replacement.

You can order pressure-treated wood to your specifications —Penta also keeps it in good condition in your repair yard until it's used. For complete information about *Penta-chlorophenol, the modern wood preservative, write to THE DOW CHEMICAL COMPANY, Midland, Michigan.

THE DOW CHEMICAL COMPANY
Dept. PE-753H Midland, Michigan
Please send me:
☐ List of PENTA treating plants.
☐ Literature on car lumber treatment.

Name_____
Title_____
Company_____
Address_____
City_____ State_____

you can depend on DOW CHEMICALS DOW

Lewis sealtite car bolts

More than 85% of America's Class I railroads use Lewis Sealtite products. Designed to do a better job . . . to last longer . . . to meet the most exacting specifications. Specify Hot Dip Galvanized, Zinc finish for Double-Life and economy.

Lewis BOLT & NUT COMPANY
504 Malcolm Ave. S. E.
MINNEAPOLIS 14, MINNESOTA

LOOK FOR THIS STAMP OF U QUALITY

Sealtite bolts are available with Loktite Nut #2 (shown), or std. sq. and hex. nuts

NEW DEVICES

(Continued from page 110)

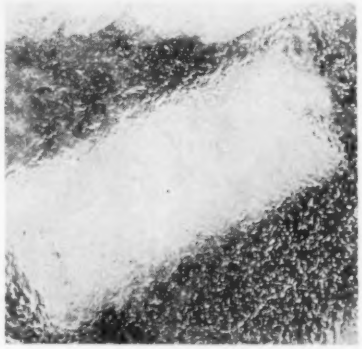
operations such as turning locomotive wheels and steel mill rolls, is composed of tungsten carbide, titanium carbide, tantalum carbide and cobalt. It has a density of 12.60 and a Rockwell hardness on the A scale of 91.0.

■

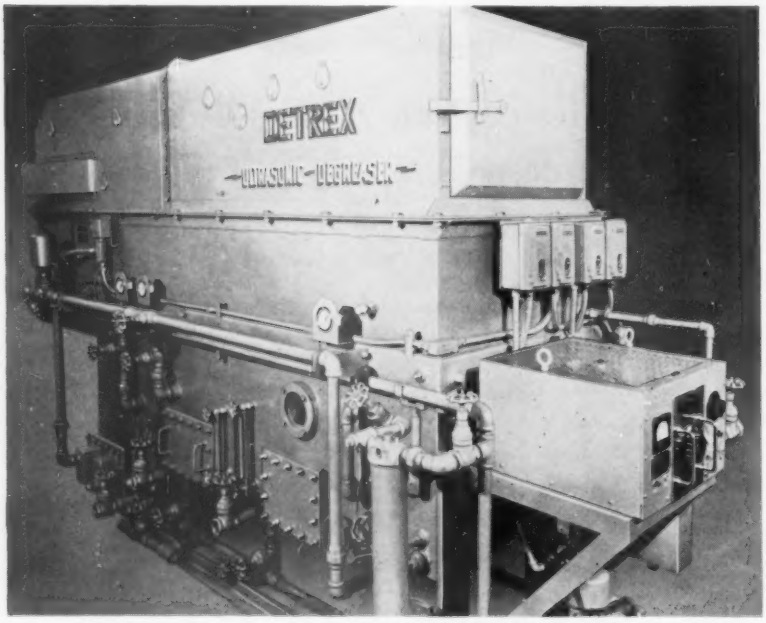
Ultrasonic Cleaning

The Detrex Corporation, Detroit, Mich., has announced the development of a practical method of metal cleaning through the use of ultrasonic waves.

The new method, known as the Detrex Soniclean Process, features an element called a transducer for developing sound energy. By employing this new element in place of the quartz previously used in ultrasonic experiments, the maker states, the limitations caused by the size and properties of quartz crystals have been overcome.



Agitation in the liquid caused by ultrasonic waves projected from a ceramic element, known as a transducer. Outline of the transducer can be seen a few inches below the surface.



An ultrasonic degreaser showing the high frequency generator in the foreground.

The transducer element, jointly engineered by Detrex and the Brush Electronic Company, is a curved piece of ceramic resembling a six-inch-long pipe, cut in half along the longitudinal axis. The ceramic pieces, which can be connected in series and arranged as desired, are designed to permit focusing and flexibility.

In the Soniclean Process, electrical energy is transmitted to the ceramic transducer, converted into sound energy, and projected through a solvent at a frequency of 430,000 cycles per second. The solvent is trichlorethylene; however, the process is not limited entirely to this material. Because a potential of only 40 volts is required to operate the ceramic transducers, they can be safely immersed directly in the solvent.

Material to be cleaned is placed in the solvent, either manually or by conveyor, directly in the path of greatest focal intensity of the ultrasonic waves. In this area an extreme turbulence is created, resulting in a deep and penetrating cleaning action that effectively removes dirt grease, chips and miscroscopic particles of soil even from intricately designed and close-fitting parts.

The high frequency generator used is completely protected by numerous safety and overload devices and has adjustable tuning drawers that provide frequency control.

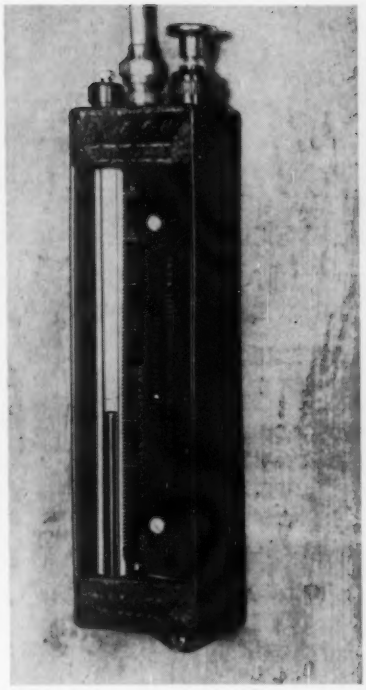
■

Remote-Reading Tank Gage

This device, the KECO remote-reading tank gage, for use with vented fuel oil, gasoline and diesel oil tanks to 9 ft. in depth is designed for quick gaging of supply without going near the tank. It can be located at any convenient location or elevation.

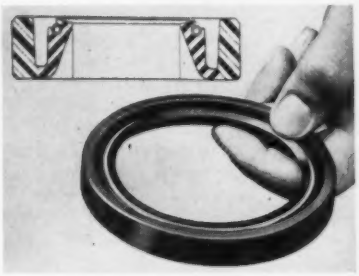
Manufactured by King Engineering Corporation, Ann Arbor, Mich., its etched-aluminum scale plate has four different scales to permit use with fuels of a wide range of API gravities.

The unit works as a frictionless hydrostatic balance and has no moving parts



except a small air pump built into the case. This case is of molded nylon and all parts in the tank are steel and are not affected by chemicals in the fuels. The gage is 8½ in. high, 2¼ in. wide and 2¼ in. deep.

■



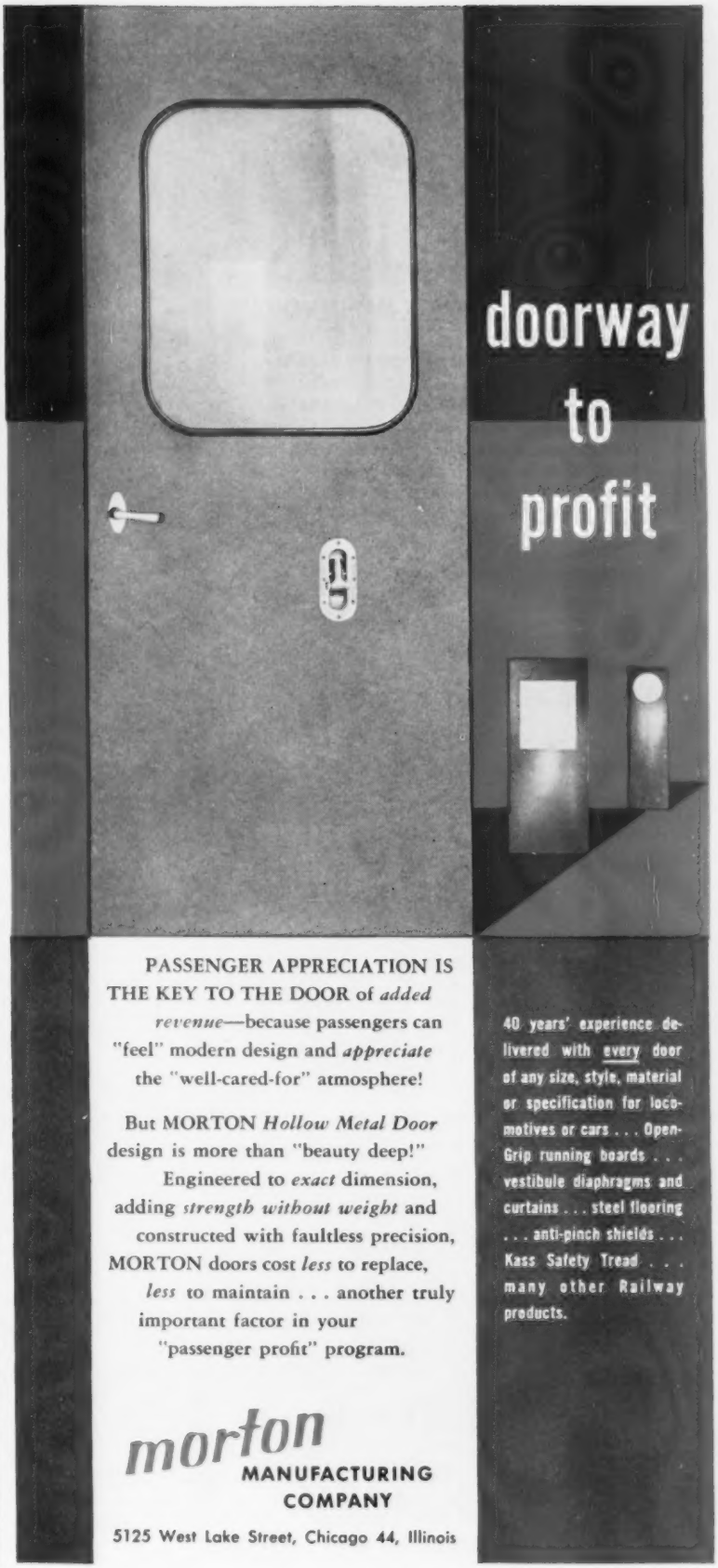
Molded Oil Seal

Designed for minimum wear, low frictional heat and less drag on the shaft, this the Model LPD Clipper Seal has been introduced by Johns-Manville, 22 East 40th st., New York 16. Its narrow lip bearing area reduces the need for lubrication yet the seal receives a greater amount of lubrication in proportion to its surface.

In its design, the lip is husky in cross section and the hinge is proportionately sturdy. The hinge controls lip contact and its flexibility enables the seal to adapt itself to shaft run-out and minor shaft eccentricities. Its heel is designed for a press fit into the bearing cavity and will conform to irregularities.

The lip and heel are of different com-

(*Continued on page 117*)



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But MORTON *Hollow Metal Door* design is more than "beauty deep!" Engineered to *exact* dimension, adding *strength without weight* and constructed with faultless precision, MORTON doors cost *less* to replace, *less* to maintain . . . another truly important factor in your "passenger profit" program.

40 years' experience delivered with every door of any size, style, material or specification for locomotives or cars . . . Open-Grip running boards . . . vestibule diaphragms and curtains . . . steel flooring . . . anti-pinch shields . . . Kass Safety Tread . . . many other Railway products.

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Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.

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Available in d-c, Model 901—and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within ½ of 1%.

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Model 785

A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.

High Frequency Electronic Analyzer—Model 769

A three-in-one instrument providing a self-contained Volt-Ohm-Milliammeter, a high impedance electronic D-C Volt-Ohmmeter, and a probe type Vacuum Tube Voltmeter for use to 300 megacycles. Exceptionally stable and accurate. Has specially designed extremely small RF and D-C probes.

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Instruments

But why MEN over 45?

Our doctors still don't know *why*, but if you are a man over 45 you are six times as likely to develop lung cancer as a man of your age twenty years ago. They *do* know, however, that their chances of saving your life could be about *ten times* greater if they could only detect cancer long before you yourself notice any symptom. (Only 1 in every 20 lung cancers is being cured today, largely because most cases progress too far before detected.)

That's why we urge that you make a habit of having your chest X-rayed every six months, no matter how well you may *feel*. The alarming increase of lung cancer in men over 45 more than justifies such precautions. Far too many men die *needlessly!*

Our new film "The Warning Shadow" will tell you what every man should know about lung cancer. To find where and when you can see this film, and to get life-saving facts about other forms of cancer, phone the American Cancer Society office nearest you or simply write to "Cancer"—in care of your local Post Office.

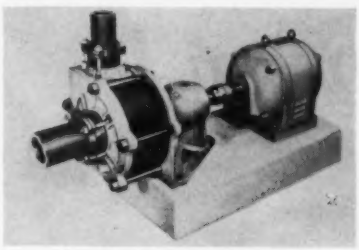
American Cancer Society

NEW DEVICES

(*Continued from page 115*)

position but they are molded together concentrically into a single unit. The lip is softer while the heel is of tougher composition that can be reinforced if desired for heavy duty applications.

■



Impervious Graphite Centrifugal Pumps

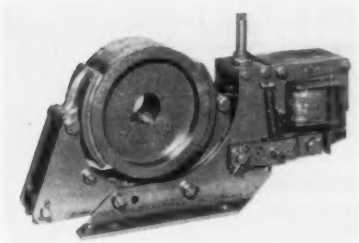
These pumps have been designed for application under severe corrosive conditions and wherever acids, salt brine, etc., are corrosive to ordinary iron and steel. Designated as Karbate series, they are products of the National Carbon Company, Division Union Carbide and Carbon Corporation, 30 East 42nd st., New York 17. According to the manufacturer, they are easier to install, easier to operate and maintain.

The Type C pump, a heavy duty model, is available in three basic sizes, having discharge openings of 2, 3 and 4 in. with either 10 or 8 in. impellers.

The Type F, a motor-mounted design, is compact with pump and motor in alignment. Its carbon-to-carbon mechanical seal is self-cooling, self-lubricating and can be adjusted while the pump is running.

Pump capacities range from 5 to 1500 gal. per min. at discharge pressures up to 1000 lb. per sq. in.

■



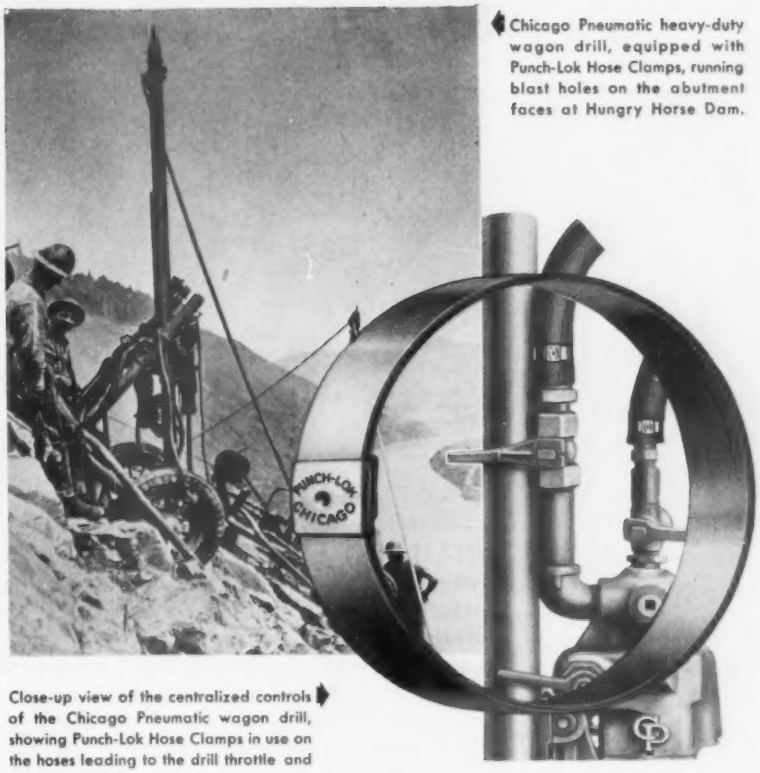
A.C. Brake

A new single-adjustment a.c. brake (Type AK) is available from the Westinghouse Electric Corporation. The result of a complete redesign, this brake combines what were three adjustments in one: (1) spring compression, to control torque; (2) magnet travel to control total shoe clearance from wheel; (3) auxiliary screw adjust-

(*Continued on page 119*)

The Perfect ANSWER FOR
ON-THE-JOB HOSE MAINTENANCE

PUNCH-LOK
HOSE CLAMPS



Chicago Pneumatic heavy-duty wagon drill, equipped with Punch-Lok Hose Clamps, running blast holes on the abutment faces at Hungry Horse Dam.

Close-up view of the centralized controls of the Chicago Pneumatic wagon drill, showing Punch-Lok Hose Clamps in use on the hoses leading to the drill throttle and blowing throttle.

With Punch-Lok Hose Clamps on the job . . . you're sure of having truly dependable hose connections. Maintenance costs are reduced because of Punch-Lok's trouble-free performance. When hose repairs are needed . . . Punch-Lok again saves you time and money. You'll be amazed to see how quickly and easily Punch-Lok Hose Clamps are applied.

"The Sign of a Good Hose Clamp"

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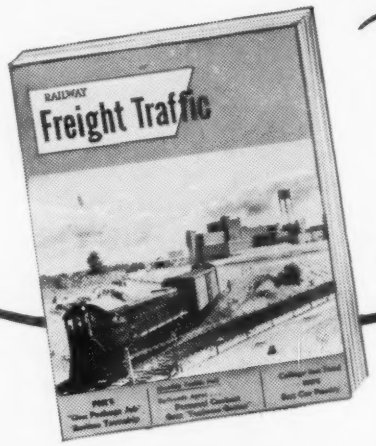

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NEW DEVICES

(*Continued from page 117*)

ment, to equalize shoe clearances. Also, a visible indicator has been provided to show the maintenance crew when and how much to readjust for brake wear.

The brake is applicable to practically all a.c. motor installations that demand start-stop operation or quick decleration, such as cranes or machine tools. Although designed for normal mounting on a horizontal plane, it will operate satisfactorily regardless of the angle of the mounting plane.

■

High-Voltage A.C. Insulation Tester

Designed for testing up to 30,000 volts a.c., yet retaining maximum compactness and portability, the model 573A Hypot, made by Associated Research, Inc., 3758 W. Belmont avenue, Chicago 18, provides a.c. output voltage continuously variable from 0-30,000 volts at 1 kva. capacity (1.5 kva. intermittent). The input is 115 volts, 50-60 cycles. The instrument is housed in a gray wrinkle-finish steel case 21 in. x 16 in. x 18 in. and weighs 178 lb.

Short circuit protection is provided by a manually reset primary circuit breaker with a secondary trip. Excess leakage current in the test circuit is indicated by a panel-mounted neon lamp. Other features include 4½-in. output voltmeter connected directly across the secondary, so that the output voltage indication is not dependent on transformer design for accuracy, *on-off* switch with a pilot light, a non-locking push-to-test button, a high voltage stand-off insulator and a ground terminal on top of the case.

■

Back-Geared Explosion-Proof Motor

For locations where dangerous fumes, inflammable gasses, explosive substances or combustible dusts may exist, U. S. Electrical Motors, Inc., Los Angeles, Cal., has announced its new right-angle Syncrogear with explosion proof motor. Available in 1-hp. rating with speeds from 45 to 153 r.p.m., this 3-phase a.c. motor is known under the manufacturer's designation as Type SESV-GW. The explosion-proof motor is designel to comply with Underwriter's specifications for Class I—Group D and Class II—Groups F and G service. The motor incorporates a cantilever design to protect gear alignment. Mounting stresses are absorbed by the one-piece base, freeing the gear and motor housing of distortion. The design embodies splash lubrication, a hardened and ground worm, normalized castings and asbestos-protected windings.

Three CDF TAPES to meet your heat and electrical insulating needs

C-D-F Silicone Tapes for A.I.E.E. Class H Electrical Insulation. Available in Varnished Fiberglas cloth and Silicone Rubber-coated Fiberglas cloth. Resistant to high temperatures; high dielectric strength, low dielectric losses, excellent moisture resistance and high tensile strength. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated solvents. Available in a range of sizes on continuous rolls. Write for Technical Bulletin #47.

C-D-F Tapes of Teflon* have the desired mechanical and electrical properties for heavy duty motor, generator, and conductor insulation. Unaffected by temperature fluctuations, exposure to oils and greases, or weather conditions. Fiberglas supported and unsupported Teflon tapes are available in a range of sizes.

C-D-F Micabond Tapes have an inherently high and permanent resistance to heat with good dielectric properties. Micabond Tapes are used for insulating motor and generator armature and field coils, turbogenerator coils, and many similar applications where flexible high quality insulation of A.I.E.E. Classes B and H insulators are required. Available in a wide range of sizes with many different backings including: fiberglas, silk, Cellophane*, cotton, paper, and Mylar*.

If you have an insulating problem, probably a C-D-F product is the answer. C-D-F manufactures and fabricates electrical insulation, laminated and molded plastics. Sales offices are located in principal cities. Call your C-D-F sales engineer—he's a good man to know!

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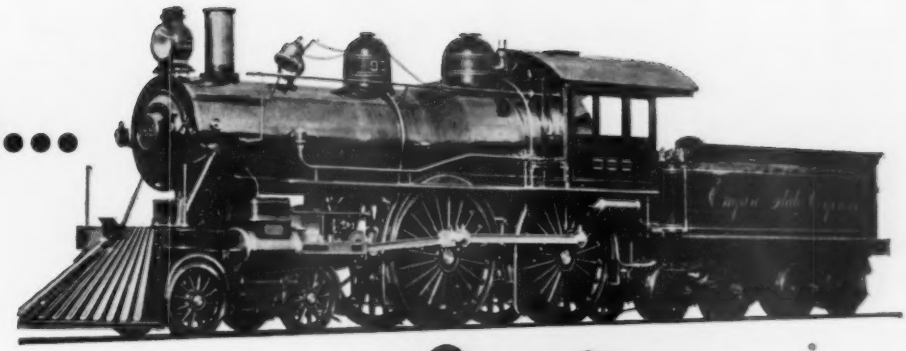

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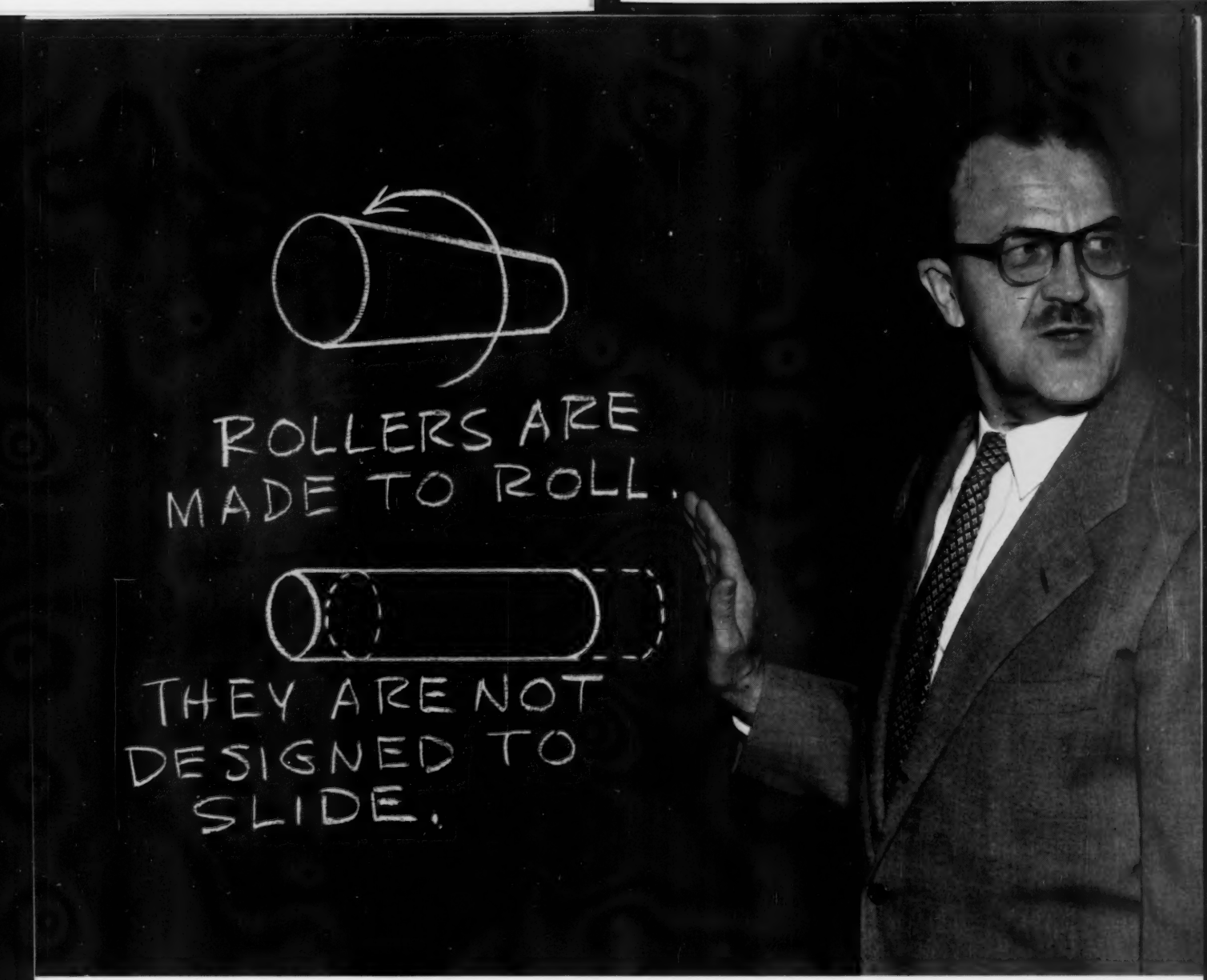


This month Dr. Oscar Horger demonstrates why Timken bearings always roll without lateral motion.

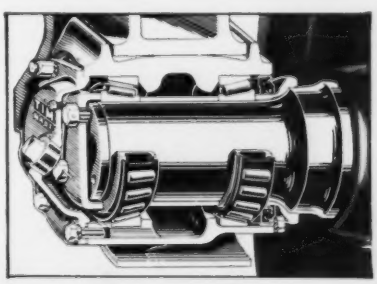
The taper makes TIMKEN® the only journal bearing that delivers what you expect when you buy a roller bearing

WHAT you really buy roller bearings for is to end the hot box problem, cut costs. The Timken® tapered roller bearing is the *one* bearing you can count on to end the hot box problem and cut operating and maintenance costs to a minimum. It's the taper! Here's why:

1) *No lateral movement within the bearing.* Roller bearings are made to roll—not slide. Under high unit pressures, lateral movement in straight roller bearings causes sliding and scuffing, shortens bearing life. It usually shows up in the form of longitudinal surface sliding marks on the rollers and races. Lateral movement also pumps lubricant through the seal and out of the journal box, draws dirt and water in. And auxiliary thrust devices are needed to take the thrust loads. These thrust devices aren't completely effective and are hard to lubricate with grease. The taper in Timken bearings prevents lateral movement, enables them to take the thrust. There's no scuffing, no pumping action. This eliminates the hot box problem, means less maintenance, less lubricant and longer bearing life.

2) *Positive roller alignment.* The taper holds ends of rollers snug against the rib where wide area contact keeps rollers properly aligned. There's no skewing of rollers to upset the full line contact and shorten the life of the bearing.

Really *get* what you pay for when you switch to roller bearings to end the hot box problem and cut operating and maintenance costs to a minimum. Get Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio.



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